FEDERAL INFORMATION SYSTEMS AND SERVICES

MARKET, 1991-1996

INPUT

About INPUT

INPUT provides planning information, analysis, and recommendations for the information technology industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Subscription services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services. INPUT specializes in the software and services industry which includes software products, systems operations, processing services, network services, systems integration, professional services, turnkey systems, and customer services. Particular areas of expertise include CASE analysis, information systems planning, and outsourcing.

Many of INPUT's professional staff members have more than 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

INPUT OFFICES

North America

San Francisco
1280 Villa Street
Mountain View, CA 94041-1194
Tel. (415) 961-3300   Fax (415) 961-3966

New York
Atrium at Glenpointe
400 Frank W. Burr Blvd.
Teaneck, NJ 07666
Tel. (201) 801-0050   Fax (201) 801-0441

Washington, D.C.
INPUT, INC.
1953 Gallows Road, Suite 560
Vienna, VA 22182
Tel. (703) 847-6870   Fax (703) 847-6872

International

London
INPUT LTD.
Piccadilly House
33/37 Regent Street
London SW1Y 4NF, England
Tel. (071) 493-9335 Fax (071) 629-0179

Paris
INPUT SARL
24, avenue du Recteur Poincaré
75016 Paris, France
Tel. (33-1) 46 47 65 65 Fax (33-1) 46 47 69 50

Frankfurt
INPUT LTD.
Sudetenstrasse 9
D-6306 Langgöns-Niederkleen, Germany
Tel. (0) 6447-7229 Fax (0) 6447-7327

Tokyo
INPUT KK
Saida Building, 4-6
Kanda Sakuma-cho, Chiyoda-ku
Tokyo 101, Japan
Tel. (03) 3864-0531 Fax (03) 3864-4114

FEDERAL INFORMATION SYSTEMS AND SERVICES MARKET

1991-1996

INPUT®

Published by
INPUT
1953 Gallows Road, Suite 560
Vienna, VA 22182-3934
U.S.A.

**Federal Information Systems and Services
Program (FISSP)**

*Federal Information Systems and Services
Market, 1991-1996*

Abstract

According to this report, *Federal Information Systems and Services Market, 1991-1996*, the federal market demand for information systems and services will increase from $16.4 billion spent in FY 1991 to $25.6 billion in FY 1996 at a compound annual growth rate of 9%.

The federal market will become increasingly competitive in response to pressure from defense and major civil agencies for connectivity, data portability, data base interchange and standardization at lower overall cost. Especially in response to the Corporate Information Management initiative, the Defense Department will acquire fewer new systems, while updating and modifying a number of recent programs.

This report analyzes the trends expressed in the FY 1992 Information Technology (IT) budget requests. Based on interviews with agency officials and recent long-range IT plans, it forecasts likely trends in technology, acquisition processes and regulations. It also notes key program developments that will shape the size and direction of this important marketplace.

This report contains 104 pages, including 34 exhibits.

Table of Contents

Table of Contents (Continued)

Exhibits

Exhibits (Continued)

Introduction

This report, *Federal Information Systems and Services Market, 1991-1996,* is produced by INPUT as part of the Federal Information Systems and Services Program (FISSP). This report forecasts information technology expenditures by the U.S. federal government for fiscal years 1991 through 1996 and includes analysis of the federal information technology budget submitted for fiscal 1992.

FISSP was initiated by INPUT for information industry clients in the federal government market, which is estimated will increase to about $26 billion in 1996, excluding classified systems.

Since the program began, INPUT annually asked interested clients to identify specific business areas, service modes, and issues they consider essential for their federal market planning. Their suggestions are incorporated into FISSP, and led to selection of this report and the service mode reports as appropriate vehicles for providing the information.

FISSP does not detail the full spectrum of information systems and services opportunities in each fiscal year, focusing instead on only those of significant new interest to vendors. These are provided in the Procurement Analysis Reports issued semi-monthly. The federal market analysis reports provide more fiscal-year detail and trends by delivery mode and agency.

A

Scope

This report covers only the U.S. federal government market, and includes only those expenditures expected of the executive branch agencies.

The major service modes included in this report are:

- Processing services

- Software products

- Professional services

- Systems integration

- Systems operations (outsourcing)

- Turnkey systems

- Equipment systems (furnished without systems design, applications software, or communications services) and maintenance

- Communications and network services

The service modes are defined in Appendix A. The definitions were revised in 1991 to clarify some subsets of the service modes.

Several of these subsets are also identified as special delivery modes, in response to client requests. The expenditures identified are part of the service modes above, and therefore not additive to them.

- EDI
- Office information systems
- Computer equipment maintenance
- Computer security

Funding information is rounded to the nearest 100 million dollars, unless the amount is much less than billions of dollars. Then the information is rounded to the nearest five million dollars. The information should not be interpreted to imply accuracy to that degree. In general, the funding information is initially derived from plans and budget requests not approved by Congress or confirmed by OMB, and may change even after approval. These changes may be dictated by the Administration or subsequent congressional action.

B

Methodology

The Office of Management and Budget (OMB)/General Services Administration (GSA)/National Institute of Standards and Technology (NIST) document, *Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government,* was analyzed to identify key expenditures in the service modes described above.

Since agencies are not required to submit supporting data for the plans to OMB, additional documentation on their OMB A-11 submissions and long-range Information Resource Management Plans was requested from the agencies and reviewed for guidance on the forecast.

Interviews with agency policy and procurement officials were conducted to identify technology trends, policy changes, and issues associated with plans to improve federal information resources and the acquisition process. Additional information on published policies and regulations are included as needed.

The section on market forecast and trends was prepared after the interviews and research on the current information technology budget submission was completed.

The INPUT forecast of five fiscal years' growth, by service mode, is based on the OMB A-11 Section 43 budget requests and off-budget plans under various federal funds and of public corporations. The economic factors for the five years are established by INPUT under the Market Analysis Program (MAP) and employed for all INPUT program forecasts. The growth guidelines are developed from annual INPUT surveys of users (government) and vendor officials, and INPUT-developed models.

C
Report Organization

This report has been organized as follows:

- Executive Overview
- Market Analysis and Forecast
- Appendixes
  A Definitions
  B Glossary of Federal Acronyms
  C Policies, Regulations, and Standards

D
Related INPUT Reports

Federal Information Systems and Services Program Procurement Analysis Reports

Federal Electronic Imaging Markets, 1991-1996

Federal Geographic Information Systems Market, 1991-1996

Federal Computer Equipment Market, 1991-1996

Federal Professional Services Market, 1991-1996

Federal Network Management Market, 1991-1996

Federal Electronic Commerce Market, 1991-1996

Federal Market Issues, 1991:
- *Uncompensated Overtime*
- *Federal 8(a) Programs*
- *Federal Anti-Drug Program*
- *GSA Schedule Practices*

Federal Systems Integration Market, 1991-1996

Federal Equipment Maintenance Market, 1990-1995

Federal Software and Related Services Market, 1989-1994

Federal Financial Systems Market, 1990-1995

Federal Computer Security Market, 1990-1995

Federal Telecommunications Market, 1990-1995

Federal Education and Training Market, 1990-1995
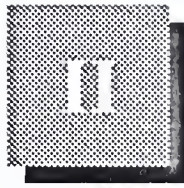
Executive Overview

A
Information Technology Budget, FY 1992

The proposed fiscal year 1992 Federal Executive Branch Information Technology budget of $24.6 billion represents a 15% increase over the FY 1991 approved budget. Exhibit II-1 illustrates the division of the budget among the four primary components—commercial services, personnel, capital investments, and operating costs.

EXHIBIT II-1

**Information Technology
Budget, FY 1992**

- Capital Investments — 21%
- Operating Costs — 9%
- Personnel — 22%
- Commercial Services — 48%

Obligations - $24.6 billion
Contracts - $17.8 billion (71%)
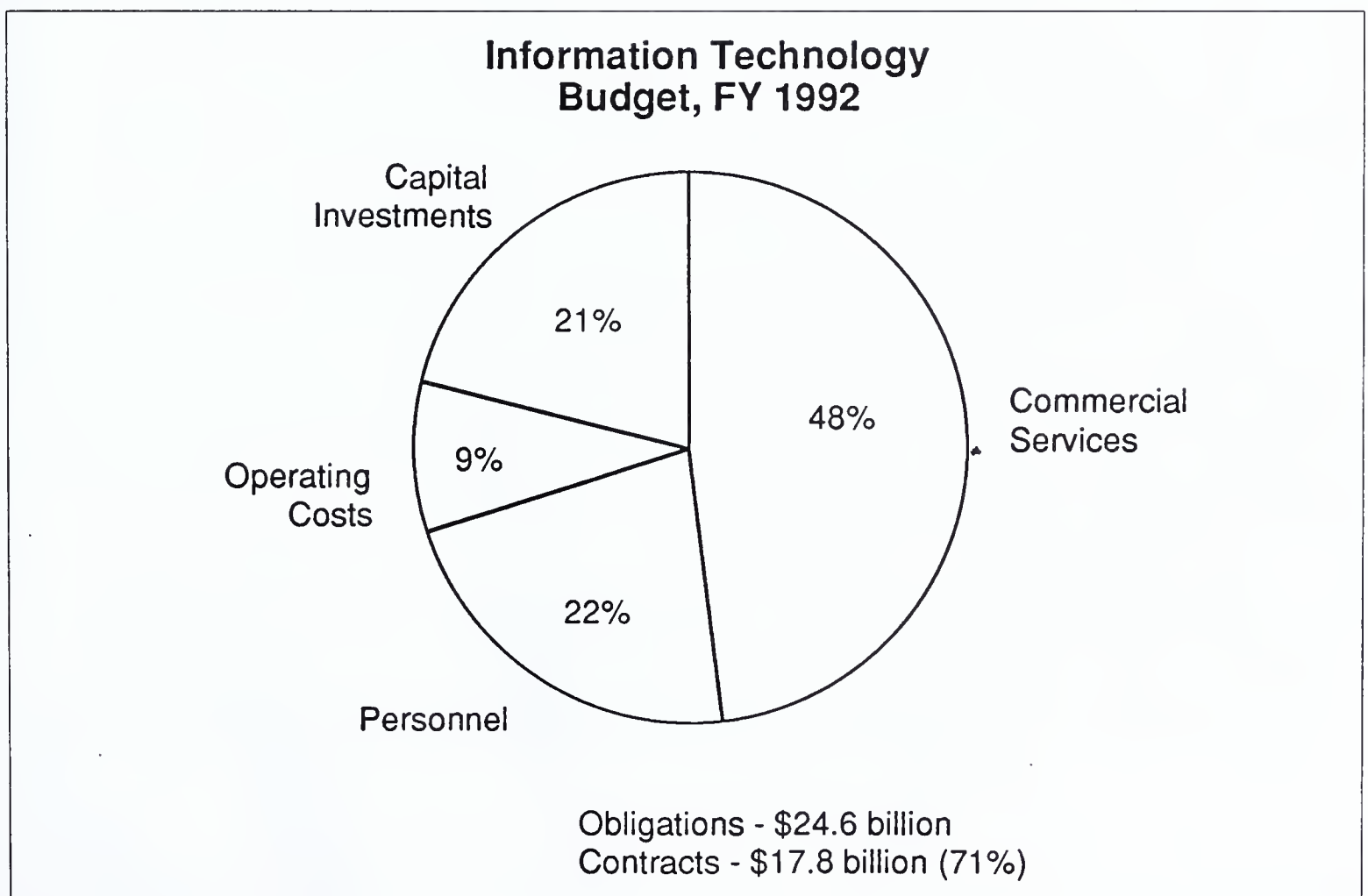
For fiscal year 1992, 71% of the budget is proposed for expenditure on contracts for systems and services, about the same level as proposed in FY 1990 and FY 1991.

- All of the commercial services segment will be spent on contracts for telecommunications and network services, processing, maintenance, and professional services. This amount is more than $680 million higher than in FY 1991.

- Ninety-four percent of the proposed capital investment segment will be spent on ADP and communications hardware and software. In FY 1992, the amount budgeted is $1,740 million, higher than 1991 and the highest increase since the mid-1980s.

- Operating costs, which include equipment leases, are expected to increase from 8% of the budget last year to 9% in FY 1992, about $500 million more.

- Personnel costs for in-house staff, travel, etc. are projected to be a slightly smaller proportion (22%) than in FY 1991, an increase of about $276 million.

This data is a summation and analysis of the individual executive branch agencies' budgets submitted under OMB Circular A-11, Section 43, including revisions through April 1991.

B

Information Technology Markets

The budget request illustrated in Exhibit II-1 represents the amounts identified in the budgets submitted under OMB A-11, Sections 43A and 43B that are part of the budget submitted by the President with his State-of-the-Union message. By mid-April, 1991, the amount requested had declined by at least $1.2 billion. INPUT reviewed the documentation to identify the key areas affected. In addition, FY 1992 shows a sharp increase that will not be repeated in the out years. INPUT's forecast of the market takes this into account. Growth rates over the 1993-1996 period will more closely resemble those of 1990.

The information technology market is expected to increase from $16.4 billion in FY 1991 to $25.6 billion in FY 1996, a compound annual growth rate (CAGR) of 9%. This forecast includes the proposed IT budget and several off-budget expenditures, such as the Airways Improvement Fund, U.S. Postal Service, and other public corporations. It excludes classified systems and legislative and judicial acquisitions.

This forecast does not consider the potential future impact of mandatory Gramm-Rudman-Hollings Act budget cuts, Defense Management Improvement Initiatives (Defense Management Review and Corporate Information Management) or cuts in the National Space Program. These changes could reduce out-year expenditures by $4-6 billion.

There are three principal components of the contract portion of the proposed federal agencies' IT expenditures, shown in Exhibit II-2:

EXHIBIT II-2

IT Markets

Category	1991	1996	CAGR (Percent)
Commercial Services	6.2	10.0	10
Computer Systems	5.9	8.7	8
Communications	4.3	6.9	10

User Expenditures ($B)
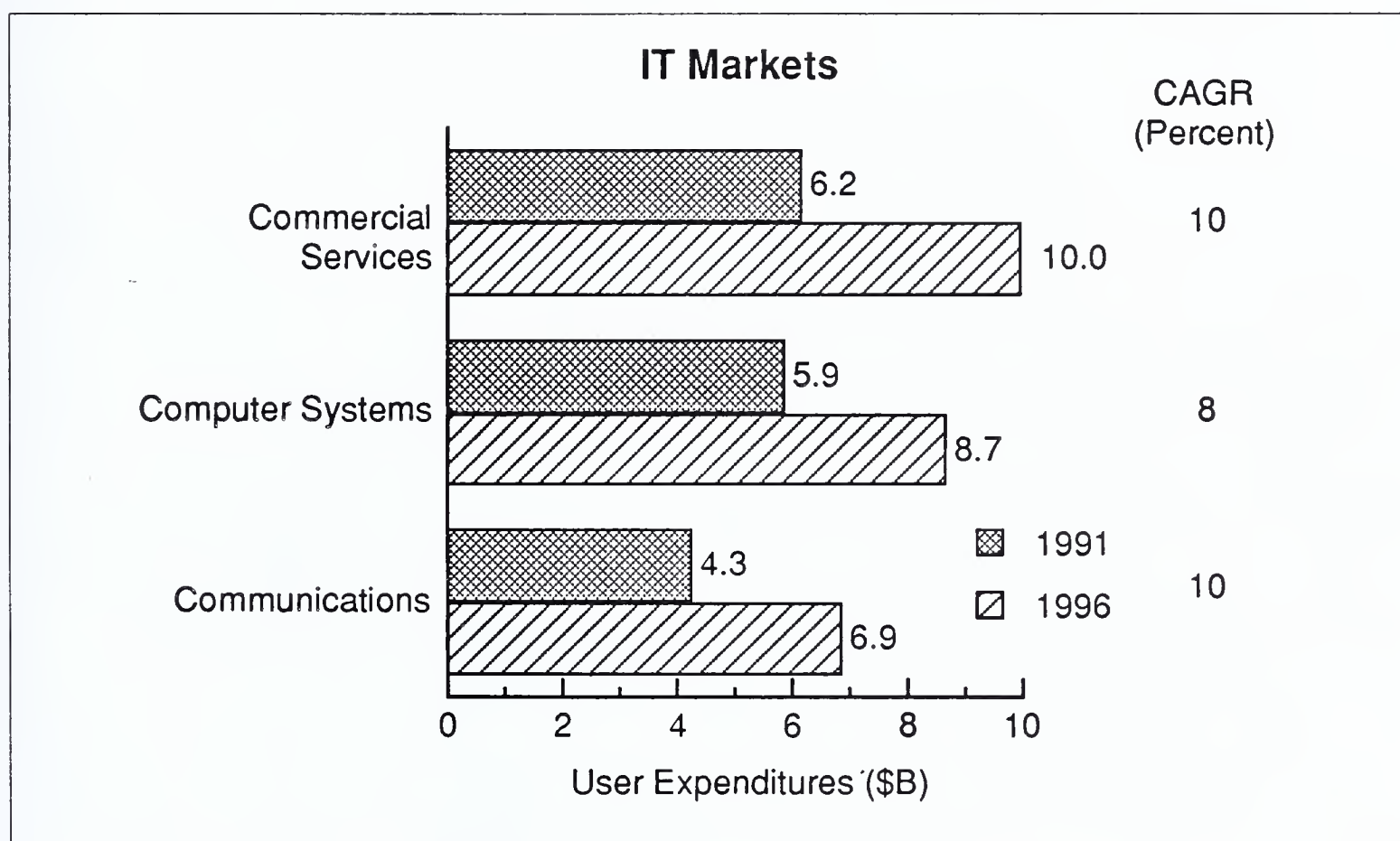
- Commercial services activities are the largest component, increasing from $6.2 billion to $10.0 billion by FY 1996 at a CAGR of 10%, down from earlier forecasts primarily as the result of program cancellations and out-year reductions. The actual requests for 1992 are lower, with increased expenditures in FY 1994 to FY 1996.

- Computer systems, which include hardware and system software, should grow from $5.9 billion to $8.7 billion at a CAGR of 8%. The most significant increases appear in FY 1991 and FY 1992, with approval and award of several large systems contracts and upgrade of a number of

essential systems. Growth over the following four years will be down slightly from the earlier forecasts, reflecting lower hardware costs and an increased number of system upgrades rather than complete replacements.

• Communications and network services expenditures are projected to increase from $4.3 billion in FY 1991 to $6.9 billion at a CAGR of 10%, reflecting a larger base year and growth rate than seen in the FY 1989 and FY 1990 forecasts.

C
Federal Market Segmentation

One difficulty of collecting and interpreting federal information technology budgets is the different terminology applied by operating personnel, administrators, legislators, and budget specialists. Based on earlier industry studies, INPUT employs service modes to describe market conditions. INPUT added system modes to comply with OMB/GSA-derived budgetary information, as indicated in Exhibit II-3. Individual mode funding trends are discussed in Chapter III.

EXHIBIT II-3

Federal Market Segmentation

System and Service Modes

Fiscal Years

Agencies and Departments
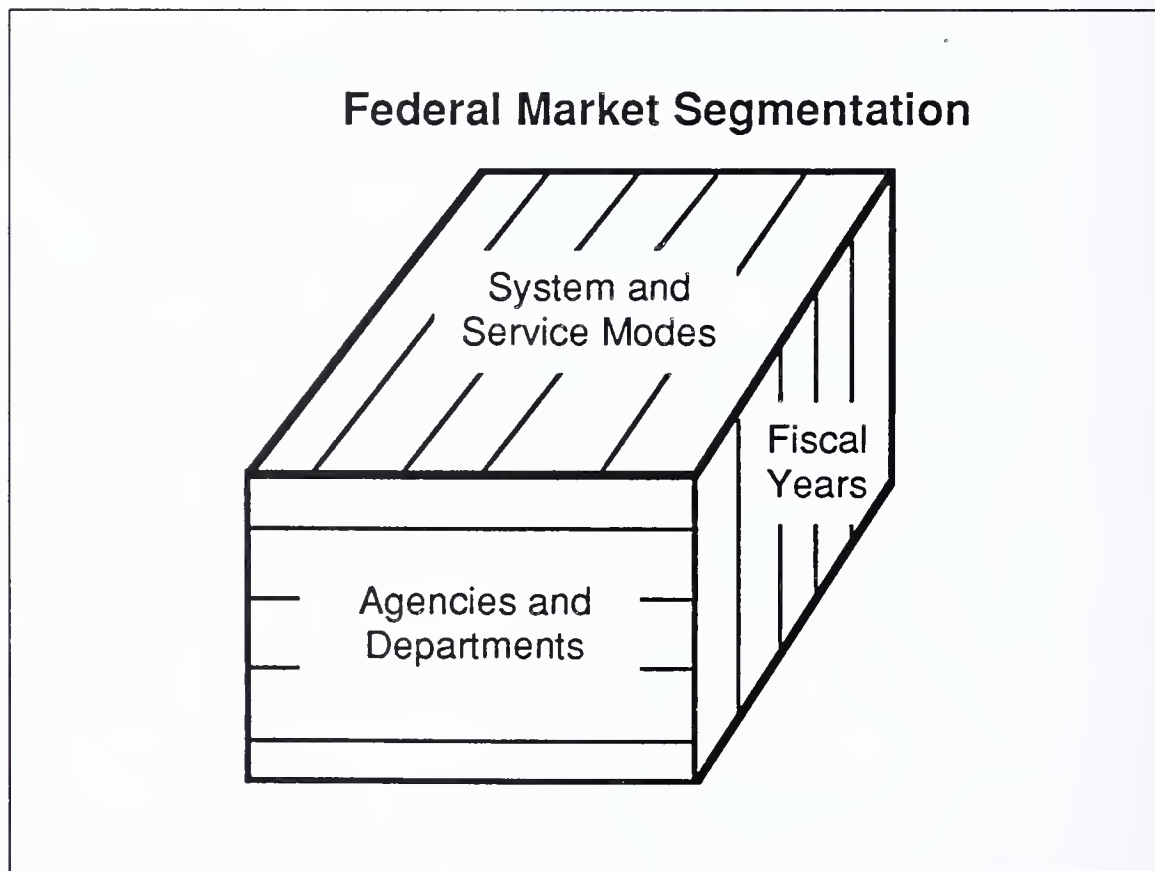
The OMB/GSA Five-Year Plan of Major Information Systems and Ser-
vices Projects describes projects in user-functional modes: new, replace-
ment or expanded systems, or operation, lease, and maintenance of soft-
ware and systems. The individual mode trends are detailed in Chapter III.
Some modes are subsets of the primary modes, to clarify expected spend-
ing patterns; the funding sources in the principal modes are described in
Chapter III.

Both service/system modes and user-functional modes identify the re-
quested budget in the fiscal years of proposed obligation, which permits
development of a common base of proposed outlays for either set of
modes by fiscal year.

The 1991 series of INPUT services and systems modes are defined in
detail in Appendix A of this report.

D
Federal Market Issues

Several regulatory and policy changes that have occurred over the past
several years will continue to impact the federal information services and
systems market in FY 1992 and throughout the decade, as noted in Exhibit
II-4.

EXHIBIT II-4

Federal Market Issues

- FIRMR amendments

- Defense acquisition reforms

- OMB circulars A-76 and A-130

- Competition in Contracting Act

- Congressional micro-management

- The Federal Information Resource Management Regulations (FIRMR) combined the automatic data processing and telecommunications portions of Federal Acquisition Regulations (FAR), FPR (Federal Property Regulations) and FPMR (Federal Property Management Regulations) in 1984. A number of changes mandated by Congress and suggested by the Defense Acquisition Regulation and FAR councils amended the initial regulations, and reporting/approval thresholds have been increased by GSA. A major rewrite of the FIRMR has been under way since 1989, including revisions of the Federal Schedules associated with it.

- The DAR (Defense Acquisition Regulations) component of the FAR (Federal Acquisition Regulations) has undergone several contentious amendments in areas such as software rights, technical data rights, second sourcing, and schedule discounts. The sheer number of changes led to an Office of Federal Procurement Policy recommendation to further reduce the volume of the FAR. Wording of the DoD-proposed commercial-buying practices may be included in the new DAR.

- OMB A-76 (Policies for Acquiring Commercial Industrial Products and Services Needed by the Government), which recommends government reliance on the private sector for goods and services, was revised in 1988. The policy became the Reagan Administration's Productivity Improvement Program (PIP), placing even more emphasis on cost-effective performance of ADP and other services. The growing emphasis on the terms and conditions, as Congress considers making A-76 into a law, is opposed by the Bush Administration and industry. They believe Congress will impose additional restrictions, which will favor in-house operation, to protect federal worker constituents.

- OMB A-130 (Policy for Management of Federal Information Resources)—in addition to restricting the collection of data from industry—established the position of information resource manager (IRM) and procedures for publishing and annually updating information resource plans. A-130 will also provide OMB guidance in the implementation of computer security at agencies.

- The Competition in Contracting Act (CICA) of 1985 provided expanded legal powers for ADP protest action via the GSA Board of Contract Appeals (GSBCA) and General Accounting Office (GAO). CICA increased the opportunity to employ negotiated contracts, and established even more-restrictive categories of exceptions that permit sole-source awards. CICA also created the position of agency competitive advocate, but this function appears to be discarded by the agencies. GAO modified its protest procedures to more closely parallel those used by GSBCA.

- The imposition of the "mini-Brooks Bill" in the Paperwork Reduction Act and changes in the 1987 reauthorization of that Act did not limit congressional micro-management of major IRM projects. Examples include the changes in the FTS 2000 competition to provide for two contractors, opposition to the plans of SSA in Systems Management Program, and funding restrictions to the IRS Tax System Redesign.

E
Information Technology Market Factors

Several factors, identified in Exhibit II-5, are impacting the growth rate of the federal government market for information technology products and services.

Congress and the Bush Administration reached an agreement in 1990 to control budget changes in 1991 and beyond by the principle of "Zero-Sum." Any proposed addition to the budget must be accompanied by a proposed reduction. Those in Congress that want to increase domestic spending on welfare, schools, medical insurance, and other civil programs are pushing for substantial reductions in defense and foreign aid (the peace dividend), and long-range programs like space and energy. These cutbacks are beginning to threaten growth of information technology acquisition and use by the executive branch.

- The overall Defense budget growth decline responds to the changes in Eastern Europe and cessation of hostilities in the Middle East. Added to this slowdown are the prospective reductions proposed as part of Defense Management Improvement Initiative (DMII), with initiation of CIM, which proposes to reduce 68 key ADP centers to 16 and limit software functions to about twelve areas.

EXHIBIT II-5

Information Technology
Market Factors

- Zero-sum budget

- Defense budget

- Regulation changes

- Standards implications

- As noted previously, changes in the regulations aimed at improving and accelerating the acquisition process appear to worsen the process. Improvements in procurement rules take inordinate time to reach lower-level contracting offices and some conditions are applied to contracts that do not require them.

- After years of indecision, civil agencies are imposing across-the-board standards such as GOSIP, POSIX, and security. Defense is moving toward these, except in the area of protocols where a conflict exists in the current Defense Communications System. Under NIST guidance, the government expects these changes to lead to improved connectivity, software portability, and data base interchange.

- The federal government has fostered new information technology in an uneven process. Complaints, especially by Congress, about cost over-runs and delivery schedule delays emphasize the trend to lower-risk, fixed-price bids and increasing exclusion of newer but unproven technology. Acquisition of new equipment and software will tend to be limited to demonstrated performance items.

F
Conclusions

Governmentwide information technology priorities are changing at the beginning of this decade, with the prospect of significant impact on the way information resources will be acquired and the response of the industry. The most important conclusions are listed in Exhibit II-6.

EXHIBIT II-6

Conclusions

- Near-term funding increase

- Standards implications

- Renewed market prospects

- Increasing competition

- Limited technology prospects
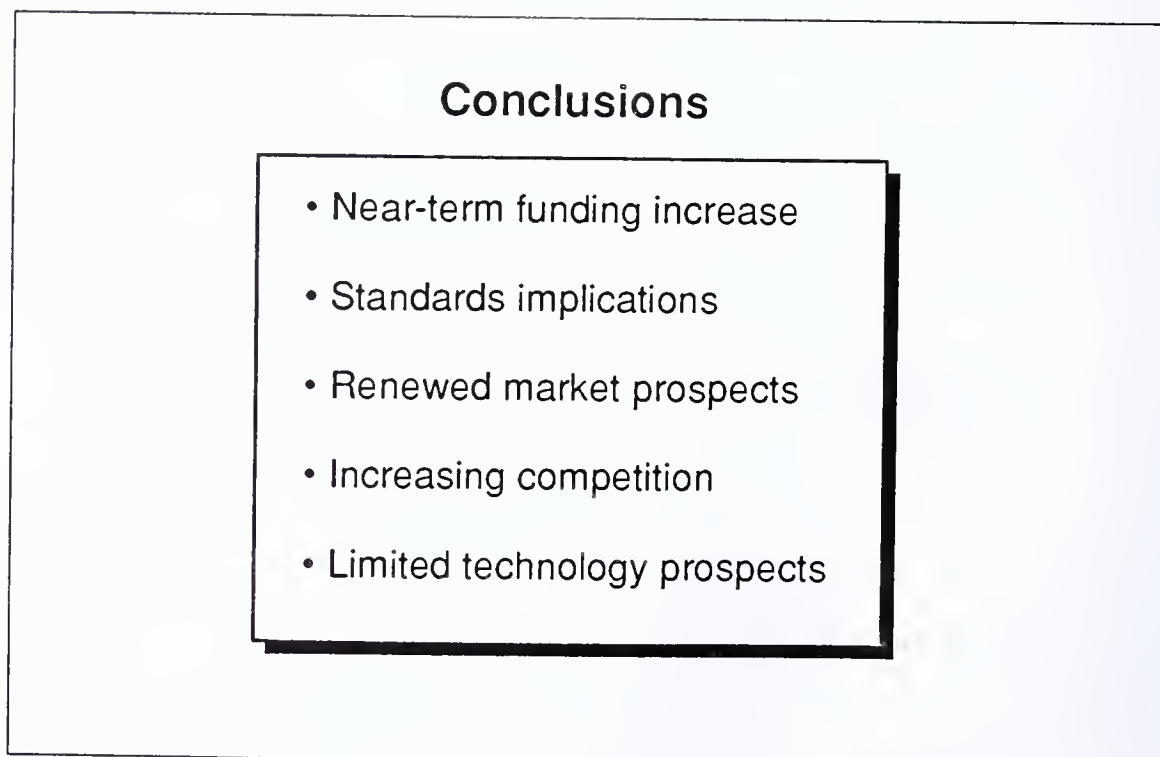
The beginning of the 1990s saw a gradual decline in the growth rate of IT acquisition in response to a declining federal budget, lower tax income from an economic recession, cessation of the Cold War, and an increasing budget deficit. The FY 1992 budget request came as a surprise, as it moved toward greater near-term expenditures than had been expected. Several key contracts were awarded in FY 1991, with significant out-year spending, and new programs have been suggested that could be funded in FY 1992. The out years of 1993-1996 are expected to exhibit lower rates of growth.

The limitations apparent in limited funding for extensive new systems can only be overcome by modification of existing systems to meet standards that improve connectivity, software and data portability, and flexible data base interchange. GOSIP, POSIX, and security standards will be more uniformly applied by all agencies. One of the few unresolved issues is the conflict of communications protocols, especially in DoD with its investment in TCP/IP.

The application of standards and the integration of standalone systems offers renewed market prospects for professional services and systems integrators. Delays in authorization of new systems and the diminished life prospects of IT resources in government facilities, destined to be closed downstream, will emphasize systems operations. The time spent in acquisition of turnkey systems implies wider use of commercially prepared packaged solutions to some of the government's basic functions.

The price to be paid by this narrowed range of opportunities is more fiercely bid opportunities, exacerbated by the melding of vendor resources through mergers, acquisitions, and alliances.

III
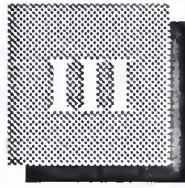
Market Forecast and Trends

A

Federal Market Overview

1. Economic Factors

Within the past year and a half, various geopolitical and financial events have changed the outlook for federal spending overall and information technology specifically. At this writing, a number of issues directly affecting the IT budget have not been resolved. Particular issues and the likely impact are discussed below.

The federal budget deficit has not been reduced by either Reagan/Bush Administration changes or the Gramm-Rudman-Hollings (GRH) Budget Act. Even for FY 1992, the threat of across-the-board outlay cuts under GRH did not produce a politically acceptable budget compromise. The 1991 budget was slightly reduced, with various out-year impacts on the IT budget. The 1992 budget proposed a one-time increase in IT spending.

The cessation of the Cold War and the democratization of Eastern Europe resulted in pressure for drastic reduction of defense spending. The initial appraisal of the effect on computers and software was a severe cut in embedded systems for platforms and weapons deployable for combat, but a relatively small reduction of overall multiyear general purpose and scientific applications.

Late in 1989, Secretary of Defense Richard Cheney submitted to Congress a plan called the Defense Management Improvement Initiative, under which he expected to save $2.4-4.2 billion. The plan created a new Defense Management Review (DMR) board, with the existing MAISRC as a subcommittee, chaired by the Assistant Secretary of Defense for Acquisition. More significantly, it also set up the Corporate Information Management (CIM) project, aimed at reducing the key large DoD ADP centers from 68 to 16 (as yet unidentified) and combining all applications into 12 functional groups. To date, the specifications for these functions have not been released by the special function task teams.

NASA's string of technology setbacks with the Hubble Telescope and the shuttle program has placed its IT plans at risk. Both the White House and Congress have investigations under way to fix the blame and fix the problem. Both investigations have created more uncertainty and substantial funding delays. The Space Station Freedom and shuttle replacement programs have been substantially reduced.

OMB Policy A-76, which recommends government reliance on the private sector for goods and services, is under attack by Congress, with at least three bills in consideration. Congress would create a "contracting-out act" to replace A-76, but with cost comparison and service restrictions aimed at protecting the federal worker base from private sector competition.

The GNP growth rate fell again in the past year, while the CPI rose. Buyer resistance led to a substantial inventory buildup, so new orders are declining. In turn, capital equipment orders are being cancelled or held in abeyance, with a direct impact on corporate taxes. The recession is causing a further reduction in businesses and employment, with marked decrease in income tax recovery.

2. Information Technology Budget

The IT budget of $24.6 billion for FY 1992 increased 15% above the $21.4 billion of FY 1991, more than double the increase from FY 1991 to FY 1992. As seen in Exhibit III-1, $17.8 billion of the budget could be spent for contracted goods and services.

- The proportion of the 1992 budget to be expended on contracts is 71%, about the same percentage as FY 1989 and FY 1991, but less than the 73% in FY 1987. The major part of the expenditure—48% of the overall budget—is planned for commercial services. Commercial-service budget items include network services/telecommunication, processing services, professional services, and maintenance. This segment is planned at $680 million greater than FY 1991.

- Capital investment (CI) has increased to 21% of proposed expenditures, or about $1,740 million more than requested last year. CI includes:

    - Computer and communications hardware
    - Computer and communications software
    - Physical plant (for the hardware)

- Operating costs have increased to 9%, approximately $500 million more than in FY 1991. About 25% of this amount goes toward leased equipment. Most is spent on facility leases, repairs and expendables.

EXHIBIT III-1

Information Technology Budget, FY 1992

Capital Investments

21%

Operating Costs

9%

Commercial Services

48%

22%

Personnel

Obligations - $24.6 billion
Contracts - $17.8 billion (71%)
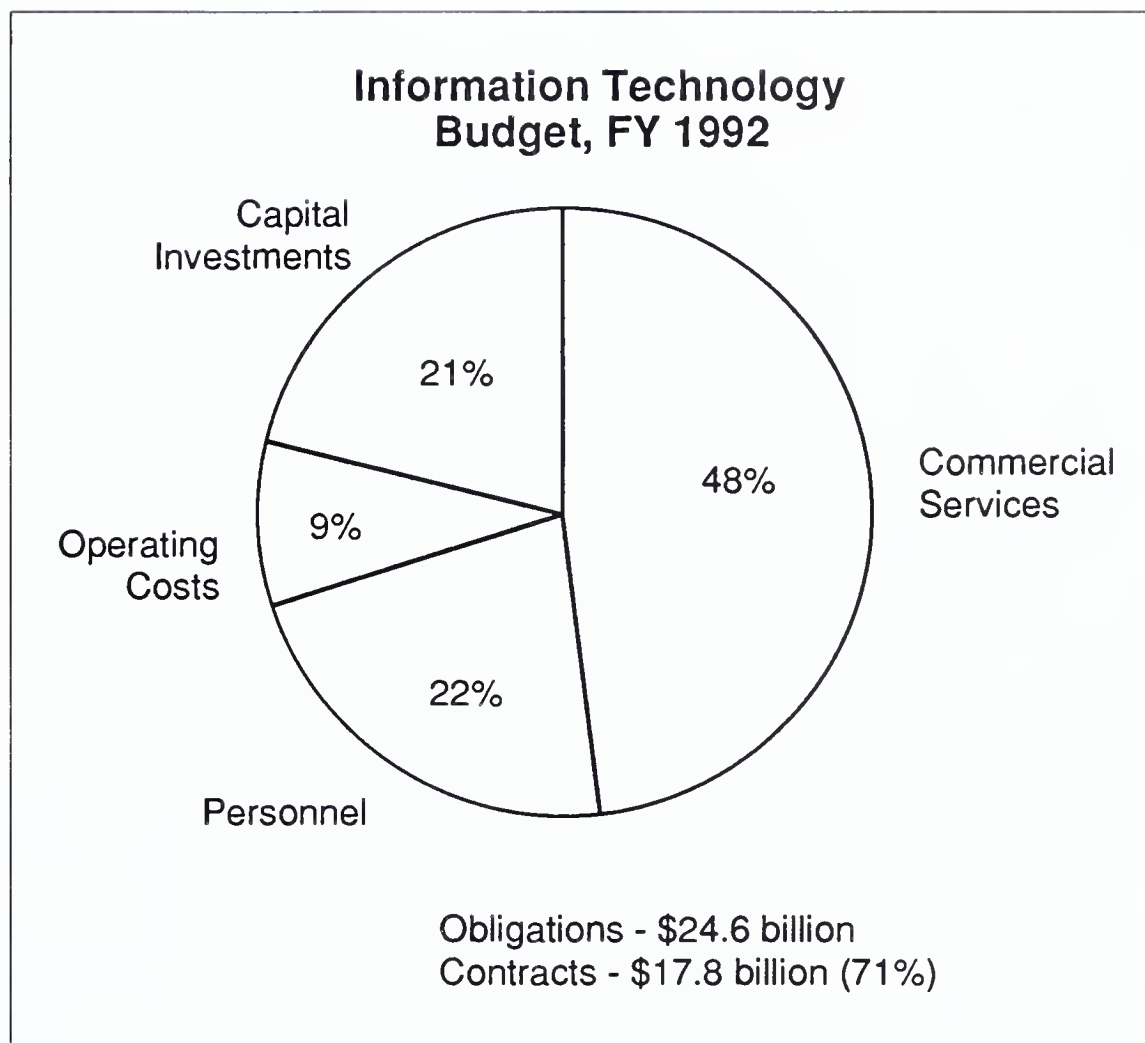
- Personnel outlays are proposed at 22%, slightly lower than last year, reflecting both pay raises for the federal staff and increased travel expenses for the IT executives and managers. The amount is actually $276 million higher than FY 1991.

This budget representation concerns the proposed outlays or expenditures in FY 1992, not the budget request submitted to Congress. The latter is the additional funding needed after various transfers for services between the agencies and from other projects. As a result, some presentations have identified $22 billion as the 1992 budget authorization request.

The proportion of the budget spent in each of these segments has varied considerably in the past decade. In the period of FY 1986 to FY 1992, there have been progressive changes, as illustrated in Exhibit III-2.

EXHIBIT III-2

Federal IT Budget Progression
Fiscal Years 1986-1992

Commercial Services — 44, 48, 46, 48, 50, 52, 48

Commercial Services — Capital Investment

Personnel — Operating Costs
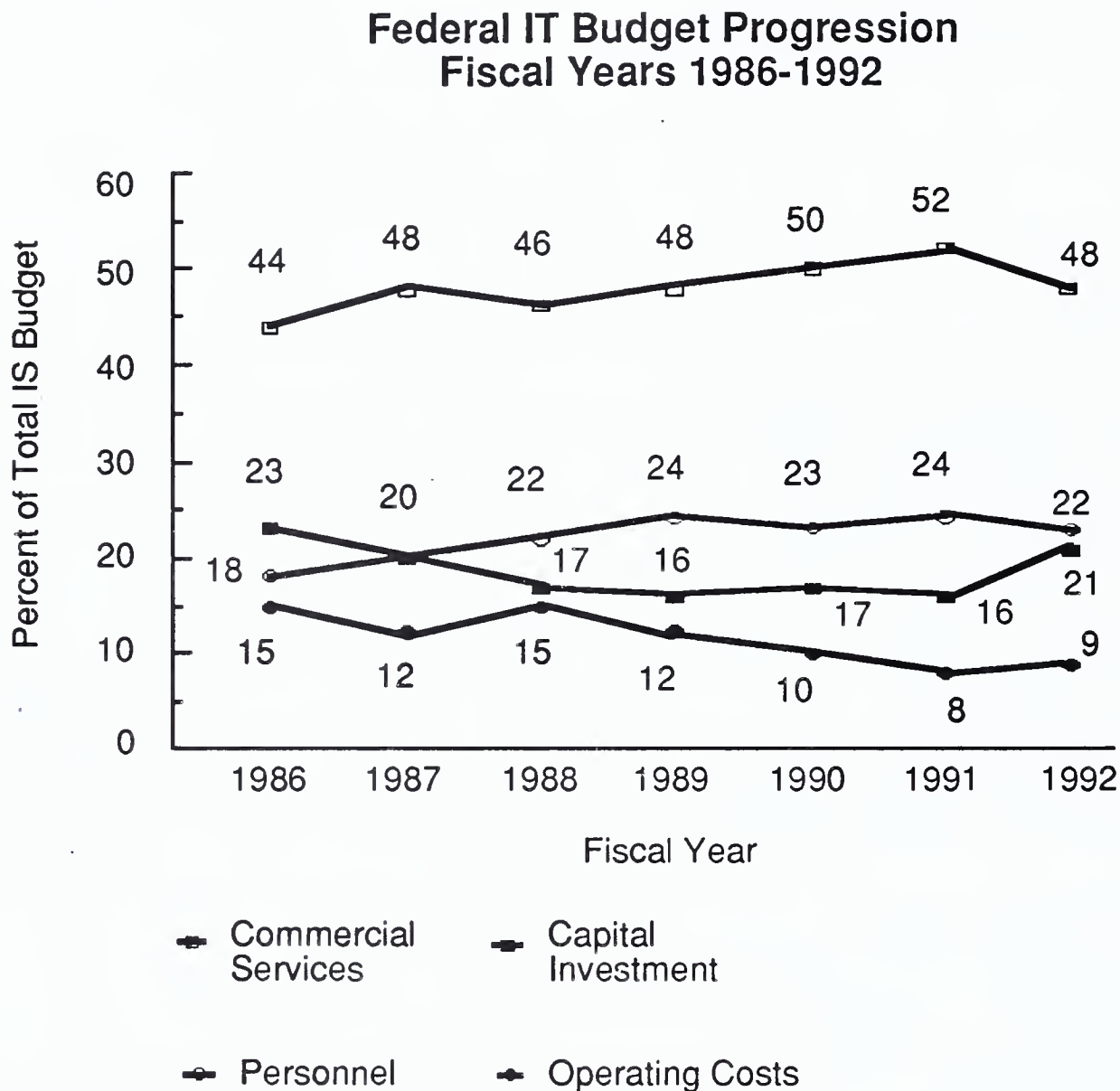
- Since 1988, commercial services have steadily increased about 2% per year to 52% in 1991, indicating a growing reliance on private sector sources. Outlays in 1992 will be only 48% of the requested funding, reflecting the substantial increase in planned capital investment.

- At the other end, operating expenses have declined over the same period as the inventory of computer leases was terminated in response to Congressional mandates in 1987-1988. A slight increase is planned for 1992 to lease software and hardware.

- The decline in capital investment prior to 1992 paralleled the reduction in cost per MIP, accelerated PC acquisitions, and the cancellation or slippage of a number of projects over this timeframe. The significant jump in FY 1992 results from release of more than one billion dollars by the CIM project office, increased spending by Treasury, and upgrades needed by a number of older information systems.

- Federal personnel costs were at their lowest in 1987 when a number of older ADP suites were removed from service. Since then, agencies have partially reversed the outward flow of qualified people.

Exhibit III-3 lists the actual outlays for each of the four segments over the period of FY 1985 to FY 1990. Data on FY 1991 will not be available until April 1992. The outlays present a slightly different distribution than requested in the budget for the year. The changes are caused by a number of actions.

- Some proposed systems or hardware procurements were cancelled or reduced by Congress.

- Other expenditures increased in response to activities added by Congress in the Budget Authorization and/or the Appropriation Acts.

- Leases were converted to ownership or terminated.

EXHIBIT III-3

Actual Outlays of Federal Information Technology Budget—FYs 1985-1990

	1985 ($B)	1986 ($B)	1987 ($B)	1988 ($B)	1989 ($B)	1990 ($B)
Capital Investments	2.8	3.1	3.5	3.3	3.4	4.2
Personnel	3.4	3.7	4.0	4.3	4.7	4.8
Operating Costs	1.7	1.8	1.9	1.7	1.6	1.8
Commercial Services	5.9	6.9	7.8	8.4	9.2	10.0
Total	13.8	15.5	17.2	17.7	18.9	20.8

A comparison of the IT budget requests with the actual outlays for the same timeframe indicates the relative closeness of the two except for 1986 and 1988, as shown in Exhibit III-4.

- In 1986, several systems were authorized by Congress to meet problems in Defense and NASA that had not been foreseen during the budget preparation cycle. Also, commercial services were increased to provide more communications and programming and analysis services.

- In 1988, Defense froze RDT&E expenditures in mid-fiscal year because earlier outlays were exceeding authorizations. By the third quarter, the Secretary of Defense authorized resumption of research programs, but denied expenditures for information technology.

EXHIBIT III-4

Actual Outlays of Federal Information Technology Budget—FYs 1985-1990

	1985 ($B)	1986 ($B)	1987 ($B)	1988 ($B)	1989 ($B)	1990 ($B)
Total	13.8	15.5	17.2	17.7	18.9	20.8
Budget Request	13.9	14.3	17.1	18.9	18.4	19.5
Over/Under (%)	-0.1	+1.2	+0.1	-1.2	+0.5	+1.3

3. OMB Five-Year Plan

The FY 1991 issue of the Five-Year Plan illustrated a growing reliance on the value of the plan by the agencies. The annually updated plan progressively identifies more of the proposed IT budget, as shown in Exhibit III-5. The percentage of the budget represented by major programs increased over the nine-year period. Plan programs amounted to 27% of the FY 1983 IT budget and in FY 1991 reached 43% of the related budget.

EXHIBIT III-5

Federal Information Technology Budgets Comparison of Major Acquisition Plans to Total Information Technology Budgets, 1983/1987/1991 ($ Millions)

Agency	FY 1983		FY 1987		FY 1991	
	IT Budget	OMB Plan	IT Budget	OMB Plan	IT Budget	OMB Plan
Defense	7,723	1,852	8,906	1,806	9,374	1,890
GSA	132	1,083	1,693	1,677	1,325	1,323
NASA	797	522	1,325	1,057	1,751	1,350
Justice	389	232	470	354	605	689
HHS	1,518	189	792	246	821	349
Agriculture	445	248	558	579	760	662
Treasury	518	729	1,247	899	1,332	1,044
Commerce	281	136	457	271	456	311
Energy	876	128	1,225	157	1,519	291
Interior	267	76	324	121	393	180
Education	68	76	65	54	84	53
VA	320	10	403	132	520	81
EPA	84	51	183	116	271	132
All Others	514	233	1,173	557	1,123	354
Total	13,932	5,565	18,821	8,026	20,334	8,709

Sources: Five Year Plan (OMB/GSA/NBS) 1983, 1987, 1991; OMB A-11 Section A3 - 1983, 1987, 1991.

It is evident in Exhibit III-5 that the value of an agency's major program funding in a given fiscal year has no fixed relationship with the requested IT budget. This dissimilarity is also noted in the federal processing services market.

• Although Defense IT budgets were half of the total each year, major ADP procurements for general-purpose resources were slightly less than one-fourth of the total funding for each year.

• The total value of major systems and services being acquired over the nine-year period is not revealed by the annual budget and OMB plan forecasts.

  - The total does not include funding for the early years of several very large systems integration programs.

  - The IT budget did not include expenditures for the FAA Advanced (ATC) Automation Program prior to 1991 because it was funded by the off-budget Airways Improvement Fund.

  - SDI supercomputers are special purpose to that program and included in project funds, rather than in the IT budget.

  - IT budgets and OMB plans also exclude planned expenditures of the public corporations, such as the Postal Service, TVA, BPA, etc., because they are considered off-budget expenditures.

The exhibit also illustrates why INPUT's Federal Market Analysis Reports are important to vendor clients. The Five-Year Plan does not cover many of the services recompetitions and critical low-level front-end studies for larger programs.

4. Embedded Computers

Embedded computer systems are not included in the Five-Year Plan or the annual IT budget. Therefore, no in-depth analysis of that market can be provided in this report.

• The earlier projected average annual growth through 1990 of the number of embedded computers in the DoD was 11% per year, prior to the defense budget cuts of 1986 to 1988 and since 1990.

• The growth in the number of embedded computers supports increased professional services in operations and maintenance contracts. In addition, significant hardware maintenance functions are being employed.

  - However, outlays are declining dramatically—particularly for custom software development and services—in the 1991-1996 timeframe.

- If newer systems are not acquired, increased demands for updating
  software and key equipment modifications can be expected.

5. Classified Systems

The unrestricted nature of INPUT's service does not permit any significant
identification and analysis of IT outlays for classified national defense and
intelligence programs. Some agencies such as DIA and DNA acquire
hardware and systems software in the unclassified market, but this is an
exception rather than the rule.

B

Application and Technology Trends at Federal Agencies

1. Applications by Equipment Size

The federal government sector's trends for applications by equipment size
are shown in Exhibit III-6. This exhibit was compiled from responses to
INPUT's 1991 survey on computer system applications by equipment size.

The civilian agencies sampled most often assigned their large-scale infor-
mation systems for information analysis, research, and mission support
applications. However, these same civilian agencies target management
systems, human resources, accounting, and word processing most fre-
quently for midsized operations. Large systems are still emphasizing
applications of a centralized nature. Midrange computers or minicomput-
ers now play a vital role in the increasingly decentralized and networked
environments in governmental user organizations. The federal user
community is demanding powerful shared resources that can handle a
myriad of department and data center functions.

Information analysis, scientific and engineering support, logistics, and
mission support are the most frequent application areas for the defense
agencies. For midsize systems, logistics, word processing, graphics, and
electronic mail comprise the largest categories of application areas. Spe-
cific technical applications, such as those identified as scientific, make up
a smaller portion of applications run on DoD minicomputers.

EXHIBIT III-6

Federal Applications by Equipment Size

Application Type	Percent of Respondents Mentioning by System Size				
	Micro-computer	Work-station	Mid-sized	Main-frame	Super-computer
Information Analysis	71	50	56	81	17
Human Resources	74	31	46	75	0
Electronic Mail	75	61	69	56	17
Electronic Publishing	89	67	33	46	0
Logistics and Distribution	74	40	39	93	0
Scientific/Engineering	77	86	75	83	80
Communications	61	65	73	93	50
Word Processing	92	72	38	38	17
Administrative	74	35	67	80	0
Finance/Accounting	71	33	64	85	0
Project Management	87	53	40	40	0

Federal agencies plan major upgrades of systems for human resources, management, graphics, and logistics and distribution applications. Part of this thrust reflects an increasing awareness by agency executives of the users of their information. This awareness is particularly evident in the area of logistics. A significant portion of system upgrades by the defense agencies focuses on upgrading existing systems with the CALS initiative rather than acquiring new systems.

Replacement of systems is most noted in office automation, information analysis, and scientific/engineering applications where rapidly changing hardware technology continues to quickly render these systems obsolete. Some agencies plan new starts in the traditional areas of information analysis and administration. In general, these programs represent efforts to bring computer-based productivity improvements to the functional operations of the agency.

Fifty-two percent of respondent agencies are in the process of downsizing or have already downsized applications to smaller computer systems. According to agencies surveyed, the most popularly downsized application is accounting/finance. Exhibit III-7 lists applications identified by respondents as being downsized.

EXHIBIT III-7

Applications Being Downsized

- Accounting/finance

- Human resources

- Scientific/engineering

- Project tracking

- Information analysis

- Imaging and graphics

Respondent agencies are downsizing to the following systems:

- Twenty-eight percent of the respondents are downsizing to microcomputer systems.

- Eight percent are downsizing to workstations and 16% are downsizing to both.

- Forty-eight percent of the respondents are not downsizing.

Of the respondents that are downsizing, many are moving accounting and finance applications to microcomputer systems. This trend may be a signal to software producers and hardware vendors for increased emphasis on microcomputer accounting and financial software.

Some applications obviously cannot be moved off a mainframe. Applications such as order processing, worldwide networking, big number crunching, DB2 data base programs, and heavy-duty account processing require a high level of computing power and speed that smaller computer systems cannot provide.

2. New Applications

The sheer volume of transactions and complexity of operations within the federal government sector requires a constantly changing focus as managers with an existing set of applications seek to apply new developments to a wide range of information service problems. New applications are shown in Exhibit III-8.

EXHIBIT III-8

Federal Government Sector
New Applications

- EDI—networks and services

- Computer-aided acquisition and logistic systems (CALS)

- Automated tax processing

- Standardized financial, payroll, and personnel systems

- AI applied to software development and simulation modeling

Electronic data interchange (EDI) represents a key emerging application. It accelerates the accurate interchange of procurement, logistics, and other data, while improving the accuracy of these transactions. Because EDI uses conventional data processing and telecommunications capabilities, the emphasis in the federal sector will be development of vendor-furnished networks, software, and services to facilitate EDI implementation.

Currently, federal EDI lags behind the explosive growth of EDI in commercial applications. With the exception of a few major programs, most EDI initiatives tend to be small pilot systems in which both government and vendors can assess costs. The awards for EDGAR at SEC and GSA's invoicing system may change that.

The CALS (Computer-Aided Logistics Support) Initiative of the Defense Department and NASA is an application of automation to logistics to accomplish several goals:

- Integrate data life cycle elements in a source-to-use network

- Ensure compatibility of data interchange between logistic systems

- Automate the acquisition elements of:

    - Stock order processing
    - Shipping document generation and handling
    - Inventory analysis
    - Technical order (repair) systems
    - Technical manual and documentation generation on a demand basis

Each major DoD agency is proceeding with CALS-related initiatives. However, some vendors have expressed continuing concern over data security and the lack of comprehensive standards. The DoD CALS policy office, in conjunction with the National Institute of Standards and Technology (formerly the National Bureau of Standards), is developing the necessary standards. However, considerably more must be done before the data security issues are resolved.

Automated tax processing applications are developing on several fronts:

- Internal automation at the IRS Regional Centers, providing enhanced capabilities for:

    - Rapid conversion of tax forms to electronic form

    - On-line retention of several years' returns

- Automated analyses to select returns that need detailed auditing (rather than sampling methods)

- Automated preparation of refund payments

• External automation of the tax return process, allowing:

- Electronic filing of individual returns
- Electronic filing of small business returns involving more forms
- Electronic fund transfers for tax payment and refunds

After a succession of GAO (General Accounting Office) audits identified increasing incompatibility and decreasing accuracy of financial, payroll, and personnel systems, OMB has directed conversion or replacement of these systems by all agencies.

• Financial systems were supposed to meet a single set of standards and produce compatible products by FY 1992. (The Joint Financial Management Improvement Program is playing a major role.) Slippage in 1990 and 1991 caused by funding shortages make the target date unlikely.

• Payroll systems must meet new accuracy and timeliness standards and be compatible within military and civilian agencies by the mid-1990s.

• Personnel systems must be upgraded to meet all of the EEO and privacy protection criteria by the early 1990s.

Artificial intelligence/expert systems applications are moving to near-term implementation and availability in several areas.

• The Department of Defense has several pilot projects and initial programs underway in which AI provides assistance to human control functions.

• AI is also being employed to develop models for a number of applications, including the automated tax audit system, gaming for military training simulators, and automated logistics processes.

• AI is being tested for use in development of applications software to include automated documentation generation and selection of alternatives that minimize future maintenance problems.

• Decision support systems, in a variety of administrative and scientific environments, continue to be the primary use of AI in the government.

3. Software Sources

a. Development Sources

The federal government continues to be heavily dependent on custom development of new applications, partly based on a perceived need for government-unique solutions and partly based on continuing dependence on a large inventory of early third-generation processors. This dependence on outside development sources is illustrated in Exhibit III-9.

EXHIBIT III-9

**Federal Government Sector
Sources of Application Development**

External (Off-the-Shelf) Packaged Software — 19%

Internal Application Development — 28%

External Custom Development — 53%
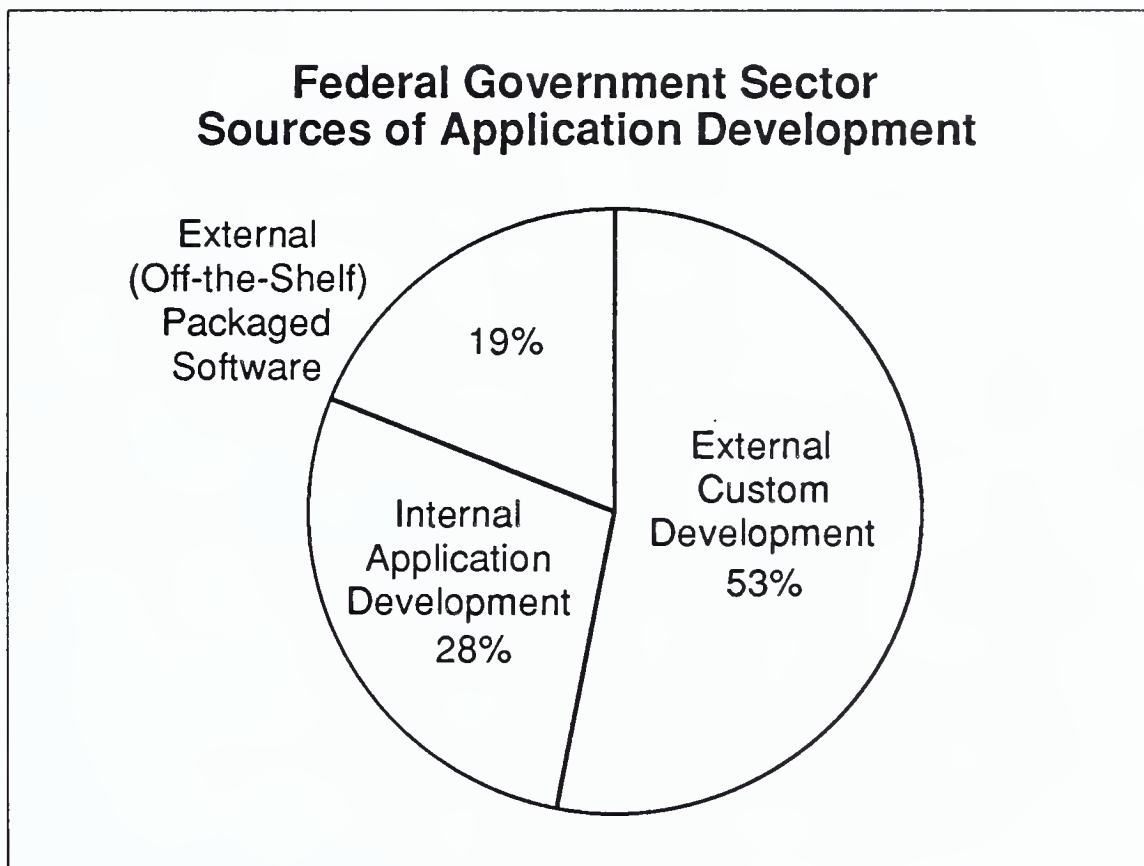
Externally developed, off-the-shelf software package use is driven by the rapid growth of end-user personal computer use. Packaged software is available for minicomputers, of which the government has a large inventory. The share of application development by this sector is expected to continue to grow.

Demands on the internal (in-house) IS staff to maintain older but critical custom software prevents them from assuming a greater role in developing new systems. GAO and NBS surveys have demonstrated that more than 70% of the software life cycle costs are expended on maintenance and under-managed enhancements.

For now and the foreseeable future, the predominant source of major new application development will be external to the government. The majority of development will come from professional services and software development firms. A smaller but very significant part of development will come from universities and not-for-profit organizations, especially in AI, supercomputers, and automation applications. Ada use will also grow sharply over the next few years, unless delayed by agency requests for waivers based on cost and training.

b. Impact of Technology

Agency and industry representatives were asked to identify technological factors that would alter the federal government's spending for information services and applications development at agencies. The factors named most frequently are listed in Exhibit III-10.

EXHIBIT III-10

Technological Trends Affecting Federal Government Sector

Trend/Factor	Rank*
Expanded networks/LANs	1
Advancements in operating systems	2
Increased microcomputer capabilities	3
Improved imaging/graphics	4
Developments in artificial intelligence	5
Advancements in communications	6

*Rank based on frequency of mention by respondents

The federal government is expanding its computer networks and use of local-area networks (LANs). The agency applications directed to LANs included administration, project management, agency data bases, and finance. Over the next few years, mission support and personnel functions will also migrate to LANs in order to distribute information among various user groups.

Advances in operating systems will support the interoperability needs of most agencies and thus rank high. Increased computing power of microcomputers is also rated as an important factor affecting future system requirements. Increased capabilities would hasten the downsizing of applications to microcomputers over the next five years.

New technologies for graphics and improved imaging offer enhanced capabilities to agencies to support their information collection and analysis requirements. Advancements in these technologies will improve productivity at government agencies.

Artificial intelligence—or more specifically, expert systems—has already been employed in limited applications. New approaches that use AI include software development, process monitoring, and simulation. AI is also gaining in use in tactical situations, automated planning, and support applications throughout DoD. Presently, however, decision-support systems represent the most common federal applications for AI. Some examples include photographic analysis for NASA, tax auditing for IRS, and eligibility verification for Social Security.

C
Market Forecast by Service Mode

1. Federal IT Market

INPUT dissociates the federal IT budget elements and recombines them into more convenient industry terms. The first reassembly provides a perspective of that portion of the budget spent on contracts for goods and services, as illustrated in Exhibit III-11. In the remainder of this subsection, INPUT provides forecasts and discussion of the individual delivery modes defined in Appendix A.

The overall market planned for federal acquisition of IT is expected to reach $16.4 billion in fiscal year 1991. INPUT believes that the market will increase at a compound annual growth rate (CAGR) of 9%, to reach $25.6 billion in FY 1996. This growth rate is based on current economic indicators, including forecasted GNP, federal budget, and inflation factors.

EXHIBIT III-11

Federal Government Sector IT Markets

User Expenditures ($B)

Market	CAGR (Percent)
Commercial Services	10
Computer Systems	8
Communications	10

FY 1991: 6.2 / FY 1996: 10.0
FY 1991: 5.9 / FY 1996: 8.7
FY 1991: 4.3 / FY 1996: 6.9
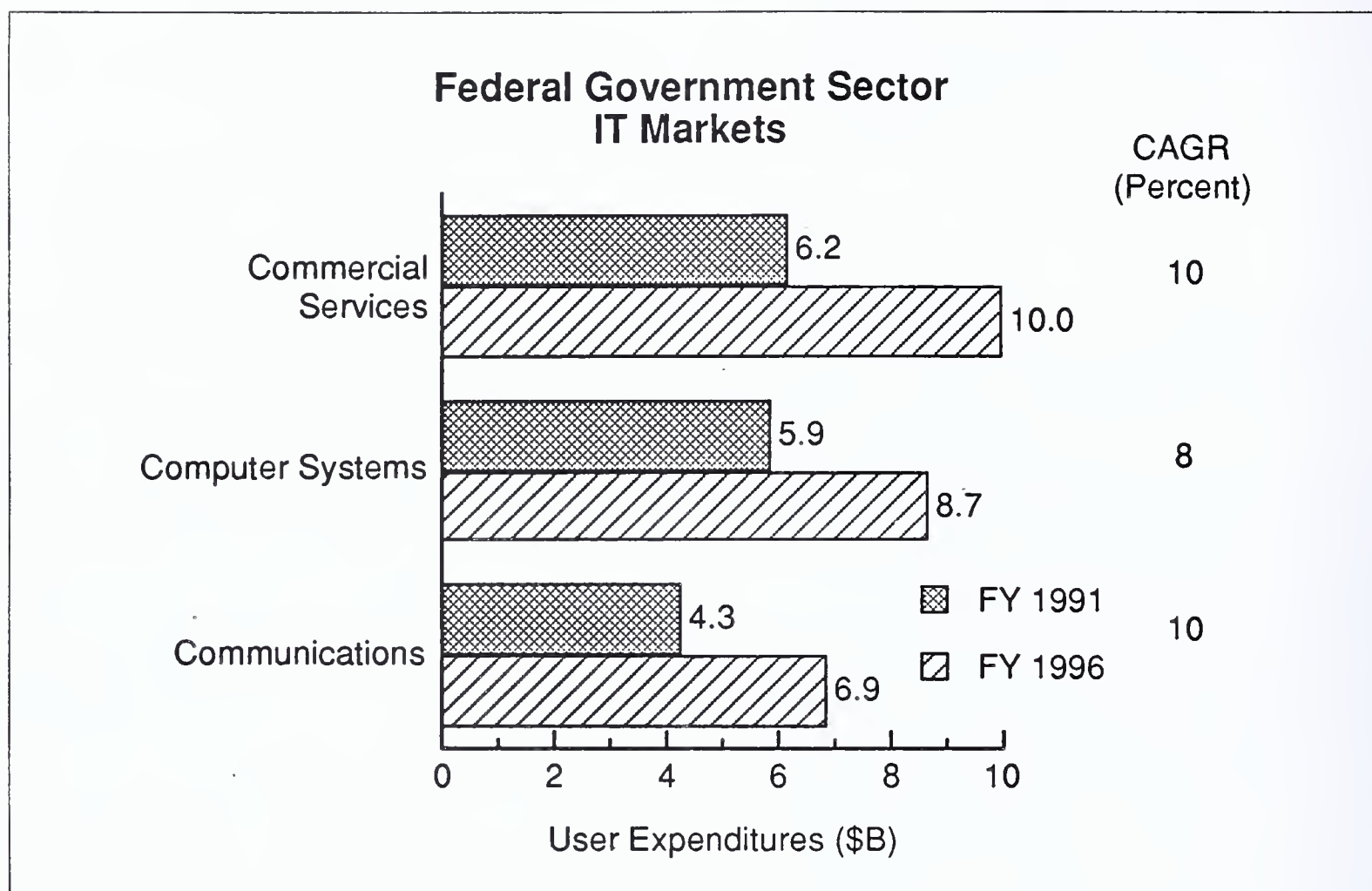
Several economic and political factors have already and can further reduce the IT growth rate, moderately to significantly. Congressional actions—or inaction—with potential negative impact include a tax increase/reduced spending compromise with the administration, or the automatic imposition of Gramm-Rudman-Hollings Act cuts across all agencies. The depth of the Defense Department budget reductions will be determined politically, and, no doubt, gradually, to satisfy the coming elections. DMR and CIM could reduce DoD IT spending by $2.4-4.2 billion in cancelled systems, but be partially offset by CIM expenditures. In an inflationary period, further budget cuts could be driven by a shrinking tax base. At present, INPUT is unable to discern a clear pattern, but sees that IT outlays have remained high during recent years, despite the rising deficit.

The largest component of this market is expected to be commercial services. The FY 1991 spending level of $6.2 billion is expected to grow at a 10% CAGR to $10.0 billion in FY 1996. This segment includes professional services, processing services, systems operations, and maintenance.

The current agency long-range plans indicate a continuing need for industry operational support, despite program cancellations and prospects of consolidation of computing resources. Last year, the predicted CAGR was also 10%, down from the 12% CAGR of FY 1989.

Computer systems includes systems integration, turnkey systems, and major equipment addition and replacement. For some time computer systems was a gradually declining market, down to a CAGR of 5% in 1989. Prospects now look better, with the FY 1991 outlay of $5.9 billion increasing to $8.7 billion in FY 1996 at a CAGR of 8%. Agencies still expect to acquire more mainframes and more-powerful desktop workstations during this period, with predominant expenditures in FY 1992.

The communications segment includes circuit/time charges under FTS 2000, network services, and customer-premise (telephone) equipment. The rate of growth declined slightly in FY 1990 from FY 1988-1989 when it was forecasted at 8%. INPUT now expects these services to increase from $4.3 billion in FY 1991 to $6.9 billion in FY 1996 at a CAGR of 10%. The forecast includes a number of dedicated data networks, more LANs, and increasing digitization.

2. Professional Services

Professional services includes consulting, design, education and training, and software development. This segment does not include the professional services associated with systems integration, systems operations, and telecommunications. The federal professional services market is projected to increase from $1.9 billion in FY 1991 to $2.7 billion in FY 1996, as indicated in Exhibit III-12. The projected CAGR of 7% is the same as 1990, but less than the 8% of 1989 and a significant drop from the 13% forecasted in 1988.

The projected need for contractor assistance makes the federal government the largest user group for professional services in the U.S. If all of the segments excluded were added, the entire market would grow from $4.8 billion in FY 1991 to $8.0 billion in FY 1996 at a CAGR of 11%.

a. Programming and Analysis/Software Development

Programming and analysis services, also called software development, is forecast to grow from $1.2 billion to $1.9 billion in FY 1996 at a CAGR of 10%. The 1990 forecast was $1.4 billion in FY 1990, $1.5 billion in FY 1991, and $2.1 billion in FY 1995, growing at a CAGR of 9%. Delays in a number of programs in Defense in FY 1990 and FY 1991 set back the level of spending, which is now being slightly accelerated to support the needed work. This subsegment includes:

EXHIBIT III-12

Professional Services Market
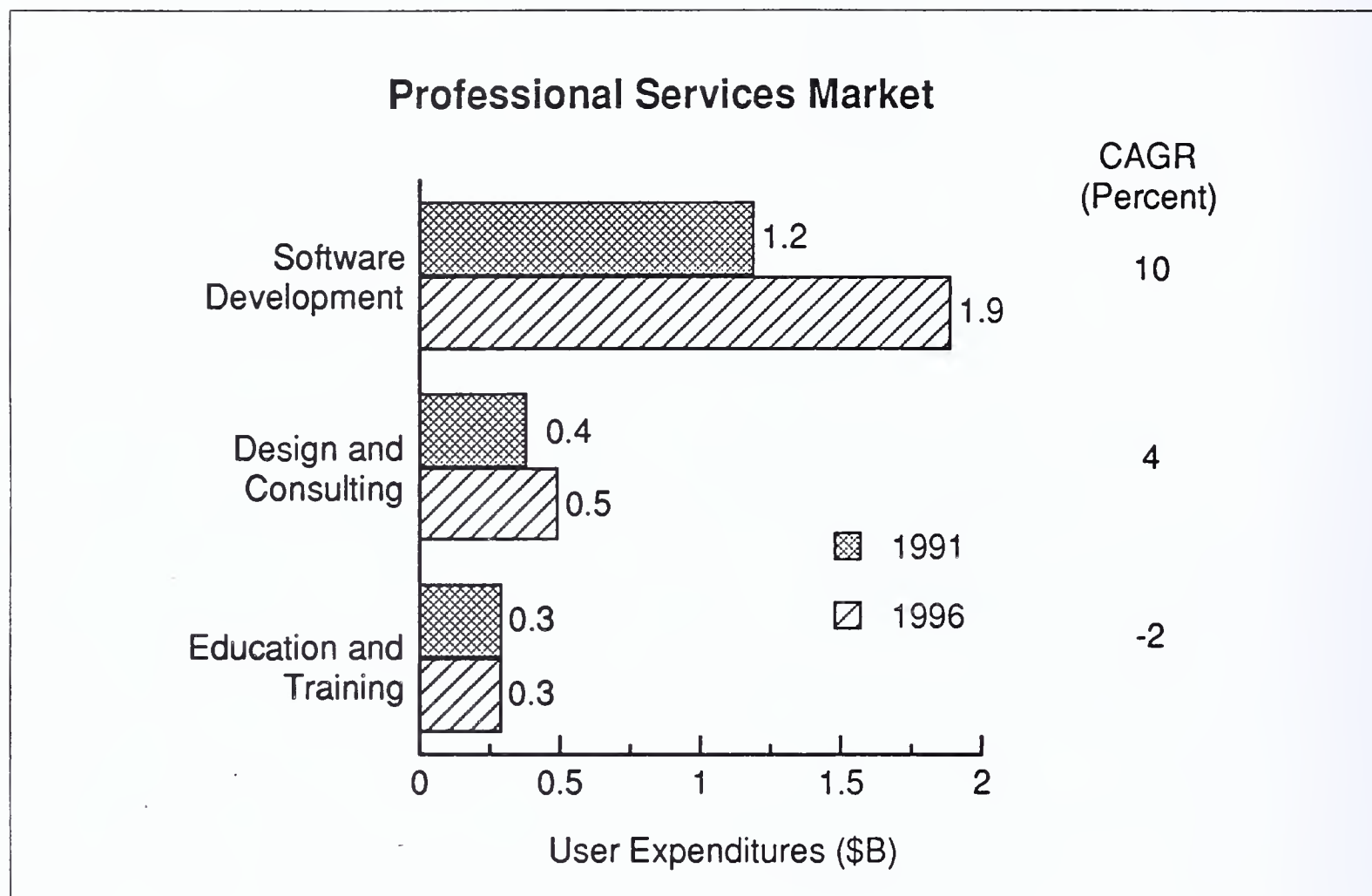
- Custom software development

- Modification of commercial software products

- Software testing of custom and commercial packages

- Software conversion

- Maintenance of custom applications software

- Independent verification and validation (IV&V) of software packages prepared by other vendors

A number of programs planned for near-term procurement should sustain the projected growth. These include Integrated Systems Engineering and Joint Staff Automation for the Air Force, IPS and TCCS for the Army, PMIS and Shipboard Non-tactical ADP for Navy, the CIM project for DoD, Transportation's (ADP) Support, and the expected award for Integration Support to the IRS.

The declining availability of programming skills in the federal government is the most significant factor behind the projected growth. Government staffing limits and the backlog of software maintenance tasks at most government data centers contribute to the demand for vendor assistance in this service mode.

Interoperability pressures—or, more specifically, the ability to exchange data—are the driving force behind the use of contractors in software development. Vendors can more readily provide the expertise needed to knit together different platforms and their applications software to accelerate data interchange.

b. Consulting and Design Services

IT consulting services in the federal market will grow at the low CAGR of 4%, from about $400 million in FY 1991 to a little more than $500 million in FY 1996. The types of services contracted include:

- Feasibility studies
- ADP requirements analyses
- Systems audits
- System Engineering and Technical Direction (SETD)
- System Engineering and Technical Assistance (SETA)

The primary demand factor is agencies' need for assistance in producing the technical justification for planned improvements in information technology resources during this period. Agencies are understaffed in the technical planning and evaluation areas. This market will continue to experience congressional pressure on agencies to minimize or eliminate entirely the use of outsiders (and previous government employees) in functions perceived as governmental management.

c. Education and Training

Education and training services relate to information systems and services for the user, including computer-aided instruction (CAI), computer-based education (CBE), and vendor instruction of user personnel in operations, programming, and software maintenance. The government normally contracts for the following separately from systems integration programs:

- Training programs
- Books and manuals
- Seminars
- Automated training systems

The delivery mode continues to erode under budget pressures and inclusion in systems integration programs. The forecast is for a 2% CAGR decline from more than $300 million in FY 1991 to less than $300 million in FY 1996. Computer training is being provided in-house by a number of larger agencies under their regular administrative budgets. These courses for end-user computing, local-area networks, distributed processing, and new software tools will be generated by industry, but not conducted by industry.

3. Processing Services

Processing services includes transaction processing with some batch mode workloads. It previously included systems operations on contractor-owned equipment (COCO), now part of a separate delivery mode—systems operations—discussed later. For the last half of the decade of the 1980s, this delivery mode continued to decline as installation of new distributed processing systems and PCs depressed the need for outside processing support. Exhibit III-13 shows the continued decline of transaction processing.

EXHIBIT III-13

Processing Services Market

	CAGR (Percent)
Transaction Processing — 140 / 165	3
Batch — 30 / 35	3

FY 1991
FY 1996

User Expenditures ($M)
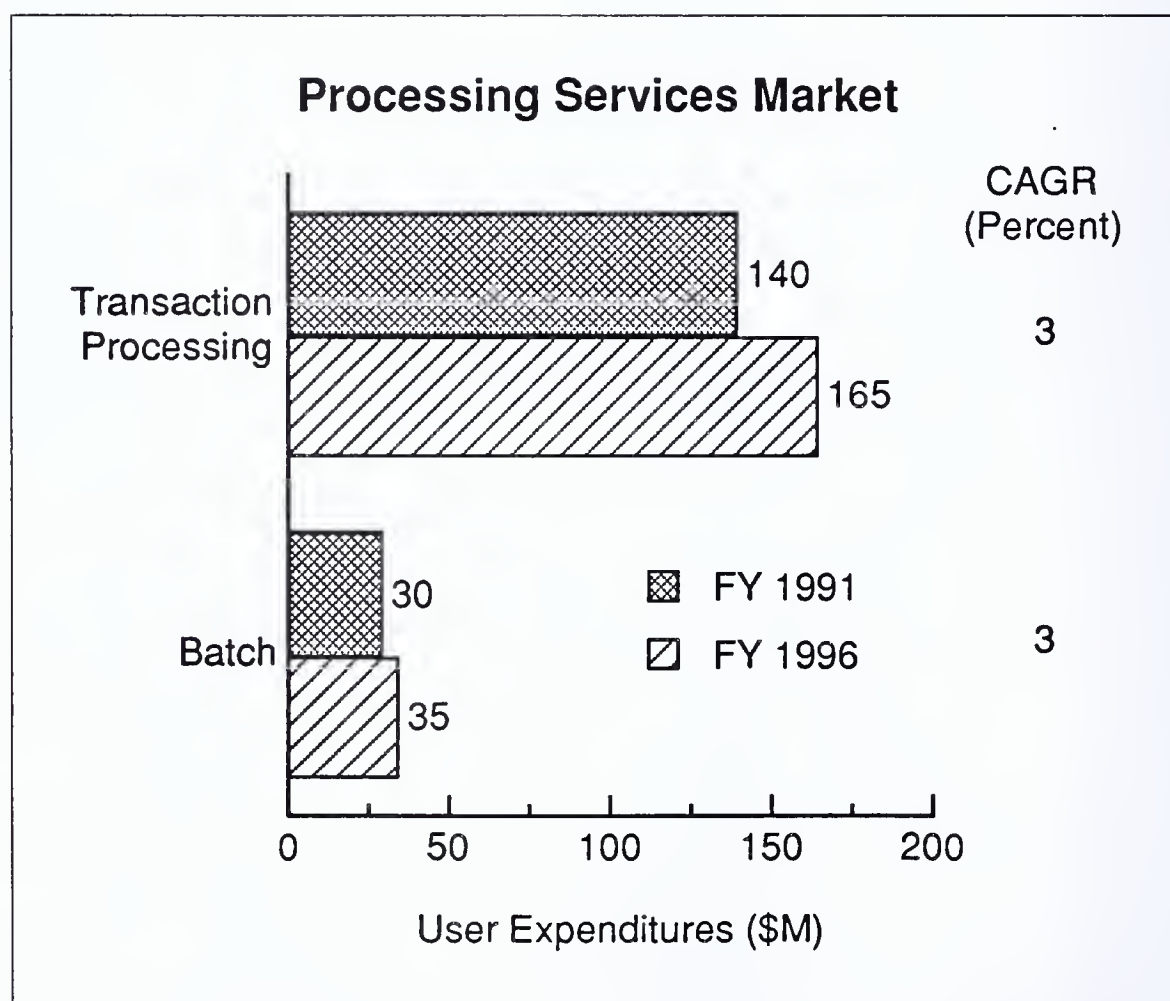
Transaction processing—previously called remote computing services (RCS) and identified as ADPE time in the federal IT budget—has continued to decline (in growth rate) since FY 1984, when growth was projected at 13%, to 3% for this period. Beginning with the IT budget for FY 1989, the funding for Medicaid and Medicare insurance, provided by HCFA (Health Care Finance Administration) of HHS, was deleted and moved into a states-aid category.

In addition, the demand for services under GSA's Teleprocessing Services Program fell from $80 million in 1983 to $26 million in 1989, especially for support under MASC (Multiple Award Schedule Contracts). GSA advised all agencies in May 1990 that TSP was terminated at the end of FY 1990 (September 1990). Transaction processing requirements must now be procured through RFPs, which may require processing requests to GSA for a DPA (Delegation of Procurement Authority). The communications must be acquired through FTS 2000, in a separate action by the agency.

Network services were separated from this delivery mode in 1989 and are now included with the communications market forecast.

A small amount of batch processing continues to appear in agency IT expenditures, but has declined to about $30-35 million per year. The bulk of this work appears in the Education Department and DoD.

Continued budget-deficit reduction actions that delay implementation of upgraded systems could lead to a stronger market than currently predicted.

4. Software Products

As shown in Exhibit III-14, the federal software products market is expected to increase from $1.1 billion in FY 1991 to $2.0 billion in FY 1996 at a compound annual growth rate of 12%. This is less than the 17% forecasted in 1989 and 13% in 1990, partly because of competitive pricing and the impact of requirements contracts that specify the application packages to be furnished in quantity.

INPUT divides the software products delivery mode into applications and systems. Applications software includes accounting, human resources, procurement, and mission-unique support software. This latter category concerns software that directly supports the mission of the agency. The following examples are typical:

- IRS uses software to assess the auditability of the tax-payer's return.

- DLA uses software to track the movement of supplies at depots and warehouses.

• NASA uses software to evaluate the usability of pictures transmitted from space.

EXHIBIT III-14

Software Products Market
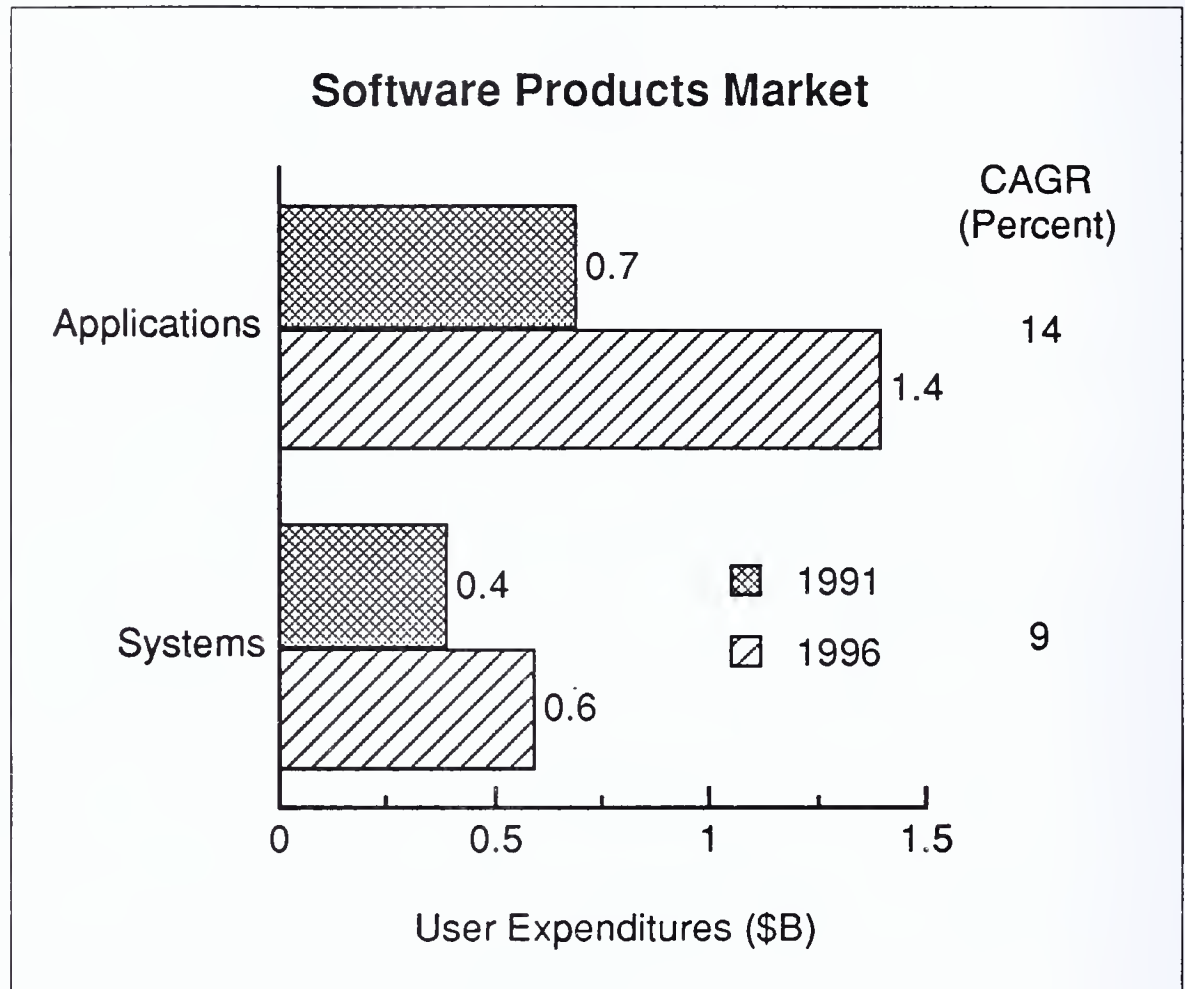
Applications software outlays are driven by the large PC inventory and updates of existing mainframe suites. Price competition is considered the key factor in the lowered CAGR of 14%, down from 15% in 1990. The market is expected to increase from about $700 million in 1991 to $1.4 billion by 1995.

Systems software is usually sold along with the hardware. Later purchases include operating systems to control compilers, DBMSs, chargeback and resource accounting systems, communications, and software development tools. There is increasing emphasis on software productivity tools.

As a result of budget constraints and heavy pressure from OMB, many agencies are beginning to view their software requirements in other than unique terms. When they have a fairly standard application, particularly an administrative application, they acquire standard packages more often than before. This leads vendors to increase development of packages that are suitable for government use and government-oriented marketing efforts.

Increasing emphasis is being put by GSA, GAO, OMB, and NIST on the use of standardized applications. Commercial-grade off-the-shelf packages that have been modified to meet government needs are being acquired. Beta testing of packages by agencies leads to bid solicitations for specific types of platforms under the QPL (Qualified Products List) procurement ground rules. This is particularly pertinent in the requirements-type (indefinite quantity, indefinite schedule) contracts.

One area receiving much attention is standard financial packages. The Joint Financial Management Improvement Program (JFMIP) issued a Core Financial System Requirements document for agency use. In connection with this JFMIP requirement, GSA issued contracts to several additional vendors for core-compliant software.

Two areas of vendor concern are the availability of government software for use by other agencies at minimal cost and constraints on commercialization of federal software under existing copyright laws. These federal centers—NTIS, National Energy Software Center and NASA's COSMIC (Computer Software Management and Information Center)—catalog tapes, disks, and documentation of both federally generated and federally funded software for use by other agencies. Commercially available software is not included.

At the other extreme, senior administrators, patent attorneys, and technology transfer officials at Agriculture, Commerce, DoD, EPA, NASA, and NIH state that prohibitions on copyrighting federal software works significantly constrain their efforts to transfer software to U.S. businesses. (GAO Report RCED-90-145 *Technology Transfer and Copyright Law*). GAO submitted recommendations to Congress for modifying the current law.

There is a strong feeling among IT officials and GAO that the newer capabilities of software technology have been substantially oversold. The continual release of newer, better, faster, more flexible, more user friendly software puts at risk the substantial current inventory and the improvement of data interchange between in-place systems.

5. Turnkey Systems

Turnkey systems are value-added packaged hardware and software solutions to specific applications requirements that satisfy, with few modifications, commercial, industrial, and government needs. This delivery mode's federal growth rate (9%), results from sharp defense budget cuts in custom-system appropriations. Exhibit III-15 shows it will increase from $855 million in FY 1991 to $1.3 billion in FY 1996.

EXHIBIT III-15

Turnkey Systems Market
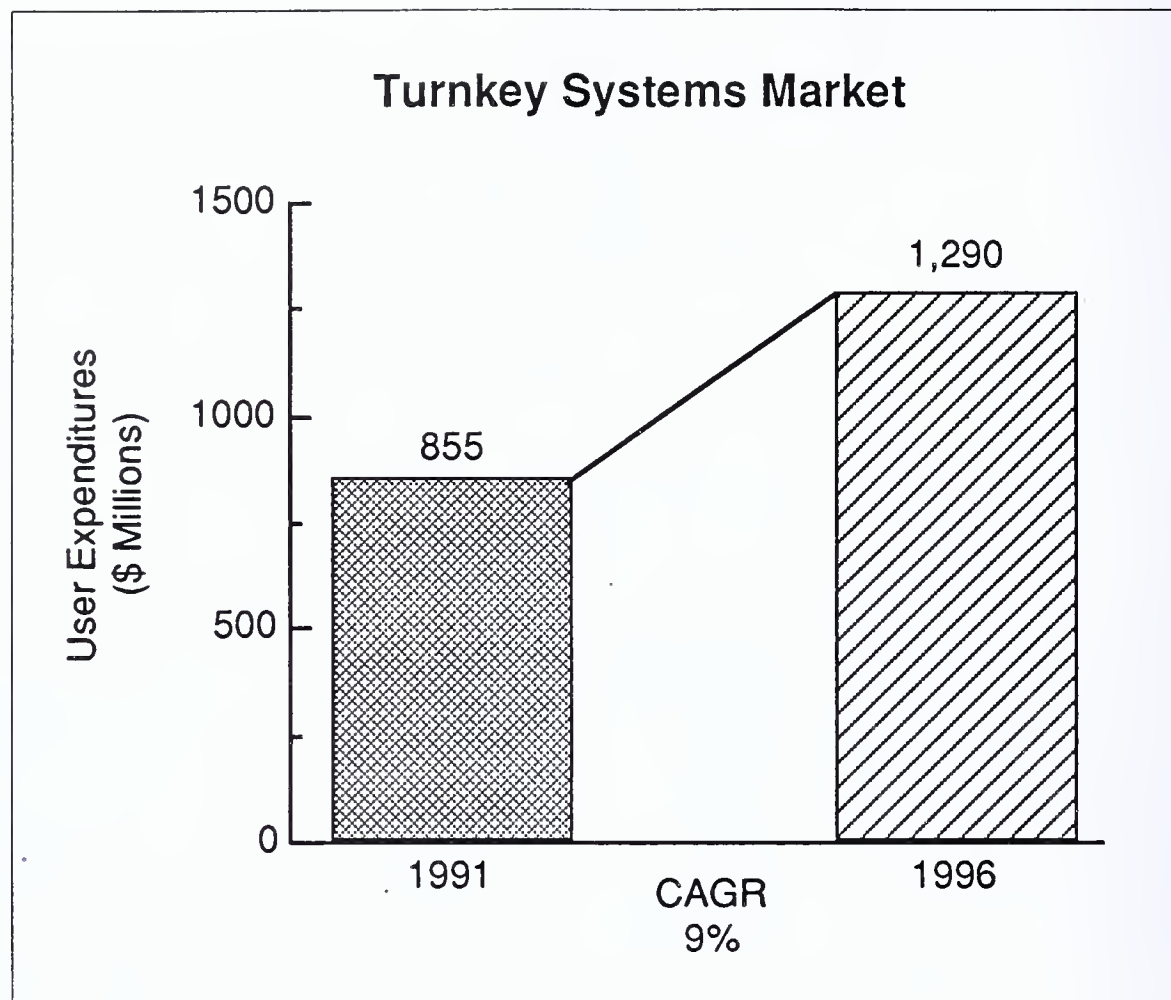
Scientific and engineering applications represent the largest area of agency turnkey system use. These include CAD, CAM, CIM, and data collection packages. On the civilian side, Commerce, NASA and Energy have the greatest need for these systems, and support most of the civilian growth. Defense also has growing requirements in this area, but currently lacks the means to satisfy these needs.

Document handling represents the second-largest application area. This includes, among other applications, DoD's initiatives on CALS (Computer-Aided Logistics Support). However, some CALS-related initiatives were cut from the current budget and others will be impacted by the DoD CIM program. Other document-handling applications of interest to federal agencies include library, graphics, mapping, and publishing systems.

Other turnkey applications include:

- Human resources
- Fleet scheduling
- Maintenance tracking
- Medical drug information
- Financial systems

Turnkey systems being procured by federal agencies include custom design and applications. The vendor provides the entire system, including applications software and special peripherals. Also, vendors install the system, train client personnel to operate it, and provide service during the warranty period.

6. Systems Integration

The market for systems integration is expected to grow at a compound annual growth rate of 16%, from $3.2 billion in FY 1991 to $6.6 billion in FY 1996, as indicated in Exhibit III-16. The growth in the federal systems integration market was rapid due to the government's focus on upgrading its in-house information resources. The professional services component of the systems integration forecast shows the largest growth rate as agencies modernize and acquire additional systems. The equipment portion of SI was flat over the past year, reflecting sizable budget cuts at many agencies, especially on the Defense side. But beginning in FY 1991 and FY 1992, there is a sizable increase in equipment acquisitions, replacing older mainframes and incorporating large numbers of workstations and PCs.

EXHIBIT III-16

Systems Integration Market

	User Expenditures ($B)	CAGR (Percent)
Equipment Systems	1.5 (1991) / 2.9 (1996)	15
Professional Services	1.4 (1991) / 2.9 (1996)	16
Software Products	0.2 (1991) / 0.5 (1996)	20
"Other"	0.1 (1991) / 0.3 (1996)	20

User Expenditures ($B)
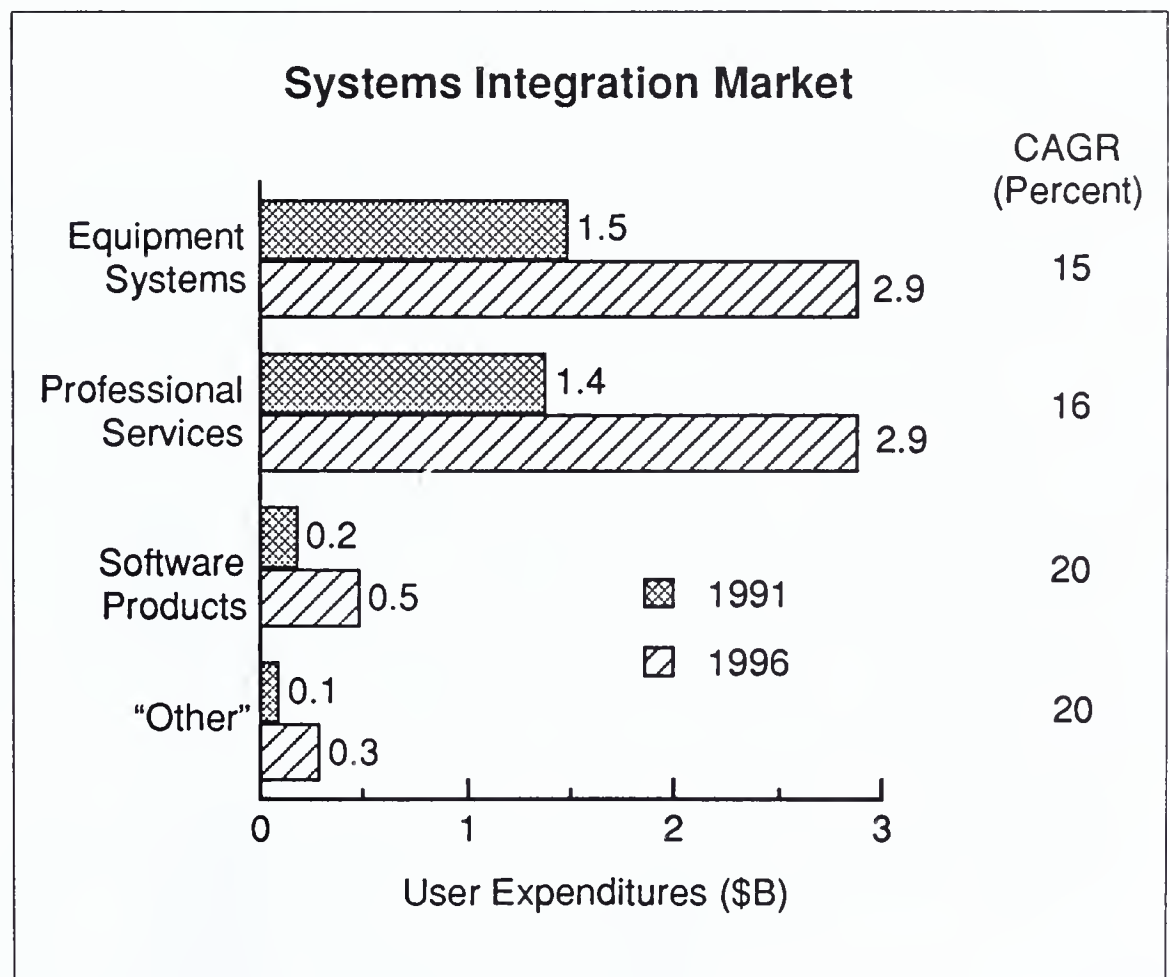
The overall growth rate of this market declined from the 1988 prediction of 18%, largely as a result of the budget squeeze induced by the rising deficit, reduction in defense spending, and delays in approval for large systems in Defense, IRS, Commerce, and NASA. The prospects for a continuing market look good, but the number of active vendors is likely to decrease as the competition becomes heated.

Professional services grew at 17% per year in FY 1987 to 1989, but dropped to 15% in FY 1990. Expenditures for this segment were 51% in 1989, but are moving toward 44% of the total spent on SI projects in the federal market. The services included in the professional services segment are:

- Project management
- Consulting services
- Design services
- Integration services
- Custom software development
- Education
- Training
- Documentation
- Operation and maintenance (systems operations) (only if specified in the contract)

The "other services" category, although relatively small in the federal market compared to the commercial market, includes transaction processing and network services during the implementation phase, site preparation, mechanical engineering, data/voice communication services, and initial data processing supplies. This segment is expected to grow at a 20% CAGR.

At this writing, a number of recently awarded and near-term projects are visible that are driving the market: RCAS and IPS in the Army at $182 million and $17 million, AWIPS-90 for NOAA at $122 million, ALMRS (now called ADP modernization) for BLM at $158 million, the MARK II system for USGS at $100 million, Treasury's System 90 at $57 million, the Document Processing System for IRS at $196 million and the State's Co-processing Facility at $39 million. At this writing, several of these projects are under protest.

Currently, civilian SI spending exceeds that of Defense by almost half a billion dollars. This reflects current budget constraints in the Defense Department. INPUT expects these constraints to continue throughout the forecast period, largely driven by CIM plans to reduce Defense systems spending by $2-4 billion by 1995. All major SI initiatives are not being cancelled; some may be deferred or stretched out. As a result, the Defense market will not surpass the civilian market demand over the next few years.

In some respects, systems integration is similar to turnkey systems. Both typically involve equipment, packaged software, and customized software. However, systems integration is generally oriented toward solving a particular agency problem, whereas the turnkey business is more oriented towards development and installation of a single application that requires little or no customization. Such an application is then useful in a large number of organizations.

Both industry and agencies objected to the GSA paper on the problems and weaknesses of the "Grand Design" of large-scale federal SI projects. Instead, they agree that a master plan is essential, but that modular implementation may be preferable to permit earlier return on investment and to adjust the design to changing requirements.

Most SI projects include provisions for communications. With the advent of FTS 2000, cost estimating became difficult in the absence of firm rate data from the two FTS 2000 contractors, AT&T and Sprint. The GSA must now be involved in providing communications.

The prospects for post-implementation support are increasing rapidly. Delays in approval of funding, implementation, and cutover are leading to obsolescence of existing ADP equipment and the incumbent federal ADP staff, and lessened opportunities for training them on new systems.

Risk management is heavily emphasized in the federal market. Despite system complexity and the government's reputation for offering incomplete requirements, the agencies want operating solutions—not just the offering of sophisticated, interested technology. Caution must be tempered by provisions for technology insertion (for instance, imaging systems) in the future.

7. Computer Equipment

Prior to the 1988 Market Analysis Reports, INPUT did not treat equipment as an independent research area, except for the components of systems integration and turnkey systems delivery modes. Client interest in equipment, including PCs and office information systems, led to several equipment-oriented reports and a forecast of likely trends, as seen in Exhibit III-17.

In FY 1991, the federal agencies spent about $5.9 billion on computer equipment, with the primary emphasis on large-scale systems, which includes supercomputers. As presently seen, this market is expected to grow at a CAGR of 8% to reach $8.7 billion in 1996. This rate is 1% higher than forecast last year, with the principal changes appearing in both microcomputers and large-scale systems. Some of the planned IQIS (Indefinite Quantity Indefinite Schedule) requirements contracts could exceed reported request levels, if past experience applies in the near future.

EXHIBIT III-17

Computer Equipment Market

CAGR
(Percent)

Large-Scale Systems and
Supercomputers — 3.0
4.2   7

Micros/Workstations — 1.7
2.9   11

▨ 1991
▨ 1996

Midsize Systems — 1.2
1.6   6

0   1   2   3   4   5

User Expenditures ($B)
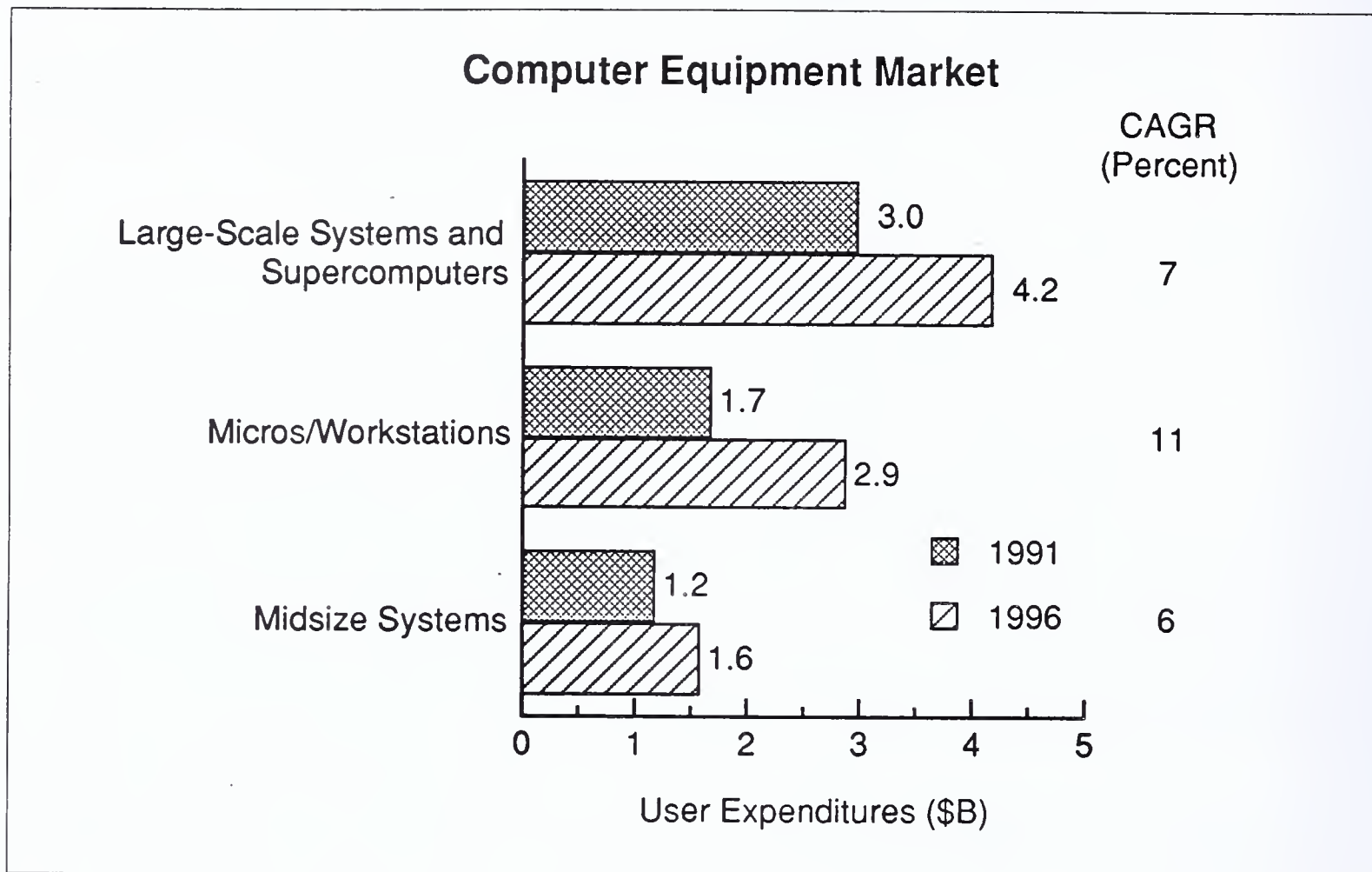
Application downsizing is moving many midsize computer-based operations into large microprocessor-based workstations and supported PCs. Large mainframes are becoming depositories for both data and application software that can be downloaded to low-end, independently operated hardware.

Microcomputer-based workstations and personal computers are being acquired via several avenues. The Five-Year Plans indicate continuing intention to acquire hundreds of thousands of units through requirements contracts. Several medium to large programs include the acquisition and installation of hundreds of terminals.

Mainframes of circa IBM 360/370 have been largely replaced because they are no longer maintainable. More modern architectures offload overhead functions from the mainframe, permitting it to operate at or near designed transaction speeds. Furthermore, replacement programs of the late 1980s moved into both higher capacity mainframes and distributed systems that are minicomputer-based.

In the federal market, system upgrades and expansions involve replacement or addition of specific ADP elements. The most recent Five-Year Information Technology Plan indicated a significant investment for increasing memory systems and data communication hardware. New leases are planned for newer technology mainframes and operating software when capital investment funds are not available.

For the 1990s, a number of expansion projects involve the addition or extension of networks. Some projects require networks to serve workstations. Still others will connect micros and minicomputers, which in turn are, or will be, tied to centralized data bases. Software for these projects is either acquired separately through professional services vendors or developed in-house.

Traditionally, federal agencies have used supercomputers for highly scientific and technical applications. NASA and the Department of Energy own the bulk of these systems, but major DoD agencies also have supercomputers installed in both classified and unclassified establishments. As federal computing becomes more complex, INPUT expects agencies to find new applications for supercomputers, thus fueling continued market growth. INPUT's PAR data base currently contains 20 programs involving supercomputers.

NASA has developed a controversial policy for supercomputer procurements. It is allowing vendors of Japanese equipment to bid on production-oriented systems, such as the Engineering Analysis and Data System (EADS II) at Marshall. However, it is precluding foreign participation for research-oriented systems, such as Ames' High-Speed Processor III initiative. INPUT expects administration trade policy, rather than procurement policy, to resolve this controversy.

Newer systems are being acquired with matching operating systems in a number of projects. This approach works with upwardly compatible applications software. In small system improvements, some applications software is acquired in packaged form.

8. Communications and Network Services

The federal market demand for communications and network services will increase from $4.2 billion in FY 1991 to $6.8 billion in FY 1996. The market for telecommunication products and services will experience a 10% CAGR through the five-year forecast period, as shown in Exhibit III-18, which is higher than the 6% predicted in early 1990.

Communications and Network Services Market

CAGR (Percent)

	FY 1991	FY 1996	CAGR (Percent)
Leased Telecom	2.4	4.0	11
Network Services	1.2	1.8	8
Professional Services	0.3	0.5	10
Equipment	0.3	0.5	9

User Expenditures ($B)
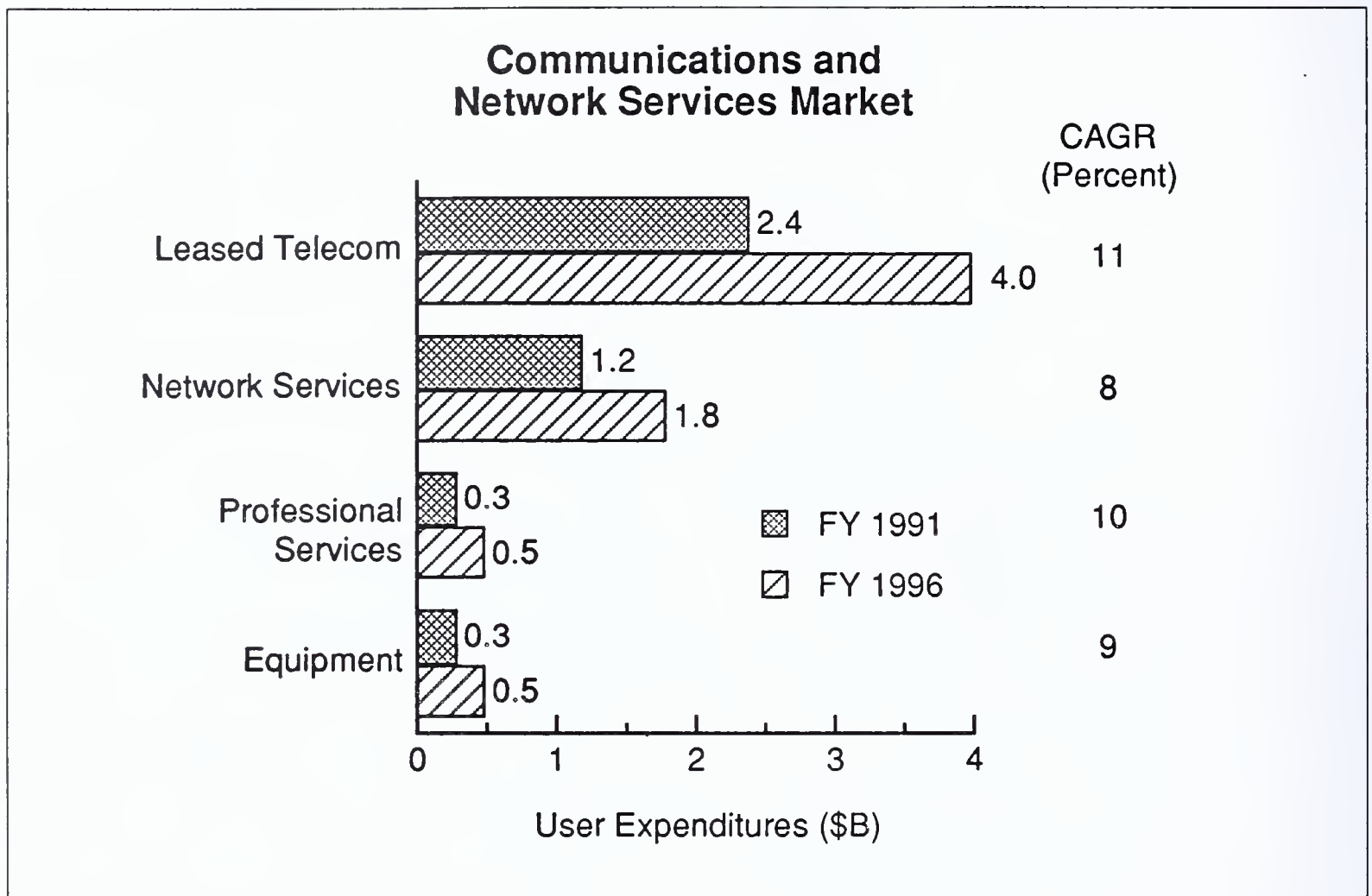
Both defense and civilian agencies have planned major initiatives for implementation over the next five years. Revisions of agency policies and new standards that are being developed and implemented are impacting these future acquisitions and will serve as controlling criteria for selection of voice and data communication services.

A number of projects still listed by the agencies were funded outside the FTS 2000 system. These include:

• Army: IG (Inspectors General) Network II and the CONUS Telecomm Modernization

• Navy: Ship Service Telephone System (won by MCI)

• State: DOSTN ($500 million)

• Commerce: AWIPS 90 Network, and the NWS Gateway

• Energy: Los Alamos Integrated Communications System II

- Census: 800 Toll-Free Service

- SSA/HHS: Toll-Free Service

- U.S. Courts: National Data Network

- NASA: NASCOM Augmentation Network

Despite the potential implementation of the Gramm-Rudman-Hollings Act, INPUT believes that the effects of budget constraints will be mitigated somewhat in the federal communications market segment. Budget reductions actually may increase federal dependence on communications services. Teleconferencing and electronic message distribution will be emphasized to reduce travel and other costs.

The earlier budget estimates for network services developed from OMB A-43 data were substantially undervalued. The funding for network applications and electronic information services are more than three times the amounts forecast in earlier years and in 1991. Most of the funds were included in the general telecommunications expenses.

Agency network service contracts typically last seven to ten years and will not be terminated due to budget constraints. Separate new and replacement network acquisitions, however, may be deferred if agencies can meet their communications requirements through FTS 2000.

Although the federal communications market has shown signs of increasing volatility, INPUT continues to believe that it will show sustained growth through the 1990s. Despite market growth in terms of spending, the number of distinct opportunities will probably decrease. Growth in some segments of the market will level off by 1994, but will be offset by new growth in other market segments.

Some other factors that will drive the federal telecommunications market include:

- Agencies will become more demanding and sophisticated in their communications requirements, either riding FTS 2000 or, when appropriate, initiating their own requirements-type contracts. Pressures continue in Congress to further limit the services available on FTS 2000 from the present contractors, AT&T and U.S. Sprint.

- Technological advances will change the market character. For example, as better network management tools become available, agencies will come to expect resulting economies and efficiencies. The network management market is expected to double during the next five years.

- As with most other federal market segments, competition will become more intense. Since this market still shows some of the vestiges of monopoly, the increase in competition will be even more dramatic, especially in the earlier phases of full digital service, which will enhance data communications capabilities.

- Communications security requirements will likely increase as a result of the Computer Security Act of 1988, as well as other forces. Most agencies consider communications to be the weakest link in information processing. Further, security considerations will likely prevent much interaction between local-area networks in DoD, at least in the near future.

9. Electronic Data Interchange

Electronic data interchange (EDI) is receiving increased attention in the government. Although its growth in the federal market lags behind that in the private sector, it is still becoming quite popular. INPUT expects the federal EDI market to grow from $180 million in FY 1991 to $280 million in FY 1996, as shown in Exhibit III-19.

EXHIBIT III-19

EDI Market

Category	1991	1996	CAGR (Percent)
Computer Equipment	93	135	8
Software	55	100	13
Professional Services	23	30	5
Networks	9	15	11

User Expenditures ($M)
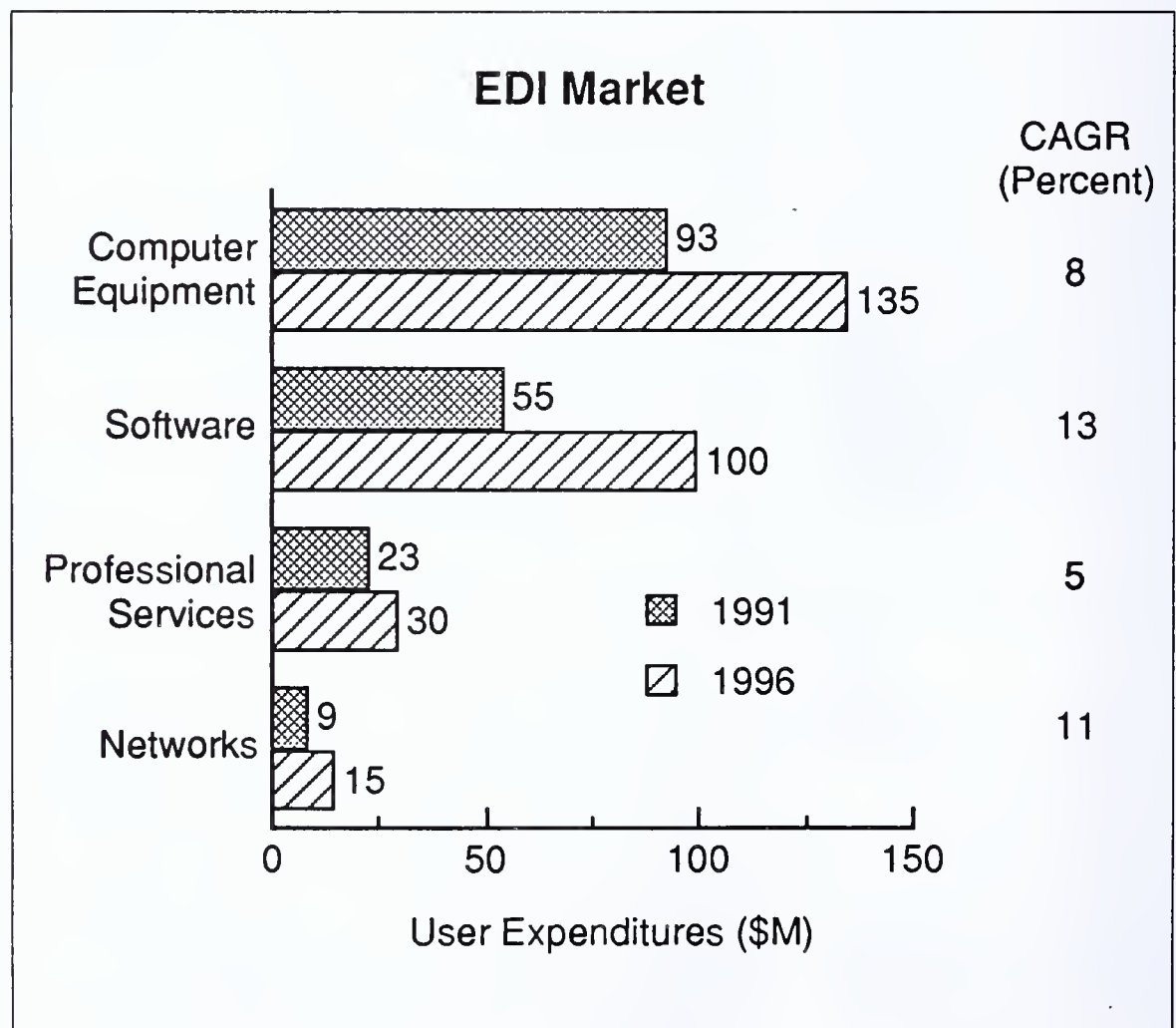
Currently, growth is occurring primarily in the software products area, reflecting:

- OMB's growing emphasis on packaged software, at the expense of tailored software development (included under professional services)

- A gradually improving federal computer equipment market

- A continuing need to realize the productivity gains associated with EDI implementation

- A growing trend among some network service providers to heavily discount their federal prices

- Inclusion of EDI as an area of measured development under the aegis of CIM in DoD, in connection with the CALS initiative

Unlike most other delivery modes, EDI prospects are actually enhanced by budget cuts. Federal managers can save much of their administrative expense by reducing paperwork. Greater automation of procurement, invoicing, human resources, and other administrative functions through EDI will reduce expenses and increase accuracy and efficiency.

With the exception of the DoD CALS effort, no agency is taking a lead in EDI. However, other agencies applying EDI consider it indispensable to facilitate more efficient, cost-effective operations. Through pilot programs applied in traditional fixed-price environments, agencies will increase their operating efficiencies with EDI.

However, agencies are gaining greater awareness of EDI through several highly visible EDI applications being implemented through recent agency awards. These include:

- The SEC EDGAR Project for electronic filing of corporate documents

- The Navy EDMICS Program for an engineering and image processing system

- The GSA Federal Supply Service Program for sending invoices and bills of lading to suppliers

Note, however, that EDI is being included in system upgrades, not in standalone EDI acquisitions. It is still viewed by most agencies as a more productive alternative to other data interchange processes.

The policies and regulations impacting EDI are still evolving. OMB is still drafting a policy directive for agencies that will encourage EDI use. During 1988, the DoD released the Taft Memorandum to establish EDI standards and paperless processing for accounting, distribution, and payment systems at the DoD by the early 1990s.

The federal EDI market will expand as advancements are made in standards. X12 is already gaining a strong foothold among most federal agencies. Furthermore, NIST made X12 a mandatory FIPS standard in 1990. The international standard, EDIFACT, is recognized in some application areas, such as Customs, as the only standard that allows for full participation among trading partners worldwide. However, protocol differences between X12 and EDIFACT may delay the standardization of federal EDI.

Federal agencies appear to be ready to implement systems under GOSIP, the Government Open System Interconnect Profile. GOSIP is a subset of the international Open Systems Interconnect Communications Standards. GOSIP will support interoperability and data exchange among different federal computer systems and communications networks. Agencies will use GOSIP to integrate their multivendor networks and systems. However, INPUT expects many defense agencies to continue to use TCP/IP, an incompatible approach, for the next three to five years.

10. Office Information Systems

As shown in Exhibit III-20, INPUT estimates that the federal government office information systems (OIS) market will increase from $1.2 billion in 1991 to $1.7 billion in 1996 with a compound annual growth rate of 8%. Demand for office systems peaked over the past three years, but seems to be increasing again, as the 1990 forecast called for only a 5% CAGR.

Previously, most federal OIS expenditures were concentrated in purchases of hardware components. However, the software products segment will exhibit the most rapid growth for the 1990s at a 12% CAGR.

A number of projects in this segment of the federal market indicate continuing interest. Please note that OIS is the object of several major systems integration programs.

- FBI: Field OIMS—$531 million

- Air Force: Automated Records System

- Army: AIM Program, and MILCON (Construction) Program Administration System

- Agriculture: LM/Office Automation, and Inspection Coverage System

EXHIBIT III-20

Office Information Systems Market

CAGR
(Percent)

Hardware Systems — 0.8 / 1.0 ... 7

Software — 0.2 / 0.4 ... 12

Professional Services — 0.1 / 0.2 ... 7

Turnkey Systems — 0.08 / 0.1 ... 5

Processing Services — 0.01 / 0.01 ... 9

▧ 1991
▨ 1996

0   0.2   0.4   0.6   0.8   1

User Expenditures ($B)
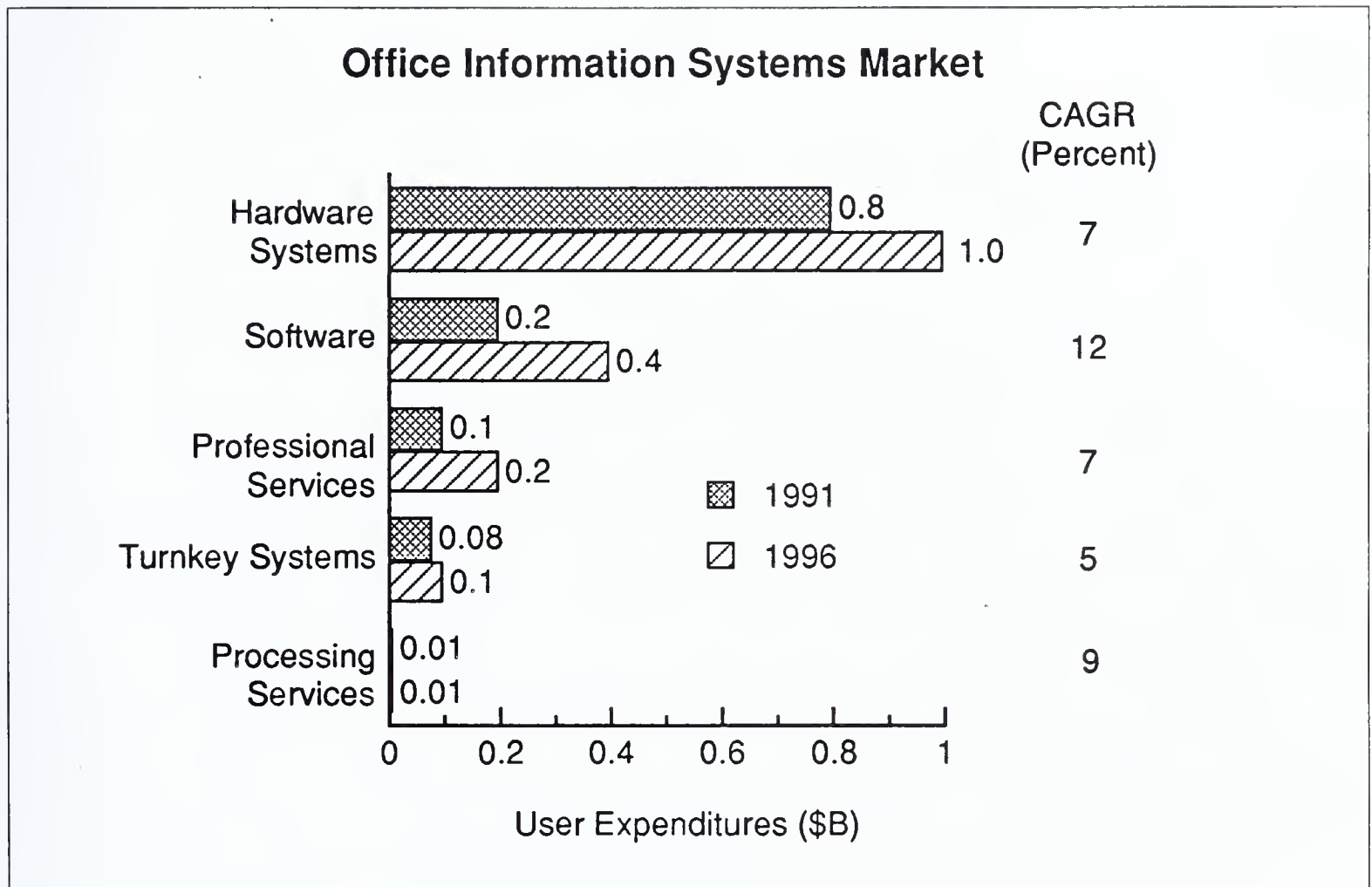
- Treasury: Data Administration Systems

- Veterans Affairs: Nationwide O/A

- Office automation projects at ED, State, and GSA

The nature of office information systems and the location of the intended support are changing. A few years ago, office automation was nearly synonymous with one person working on a standalone machine, whereas data processing involved a service provided by one department for another. Today, OIS implies work units with users tied together via LANs, and institution-level processing distributed to workstations or work units linked to these larger processors.

The rapid technical performance improvements of PCs and workstations using 386 and 486 chips are rapidly expanding the variety of applications available in the office environment for management support.

Some of the OISs being installed are also being called EIS (Executive Information Systems) or DSS (Decision Support Systems) to differentiate them from the earlier office automation context. As a result, many of these OIS automation efforts are influenced by or under the control of agency IS organizations.

Over the next five years, INPUT expects greater demands on agencies for office systems capabilities without an equally growing availability of OIS funds. This will force agencies to reorient their purchases toward more multipurpose systems instead of OIS-specific systems.

11. Computer Equipment Maintenance

Except for research conducted in the commercial market for customer services and third-party maintenance (TPM), INPUT has not previously analyzed the federal maintenance market. Client interests resulted in a Market Analysis Report produced in 1990 that provided some insight into the maintenance market. As seen in Exhibit III-21, INPUT's research reveals a market of $2.2 billion in FY 1991, with prospects of a 13% CAGR, that will reach $4.1 billion in FY 1996.

EXHIBIT III-21

Computer Equipment Maintenance Market

	User Expenditures ($B)	CAGR (Percent)
Midsize Systems	0.9 / 1.7	14
Large-Scale Systems	0.6 / 1.1	13
PCs/Workstations	0.6 / 0.9	12
Ancillary Services	0.1 / 0.4	24

Legend: ▨ 1991   ▨ 1996
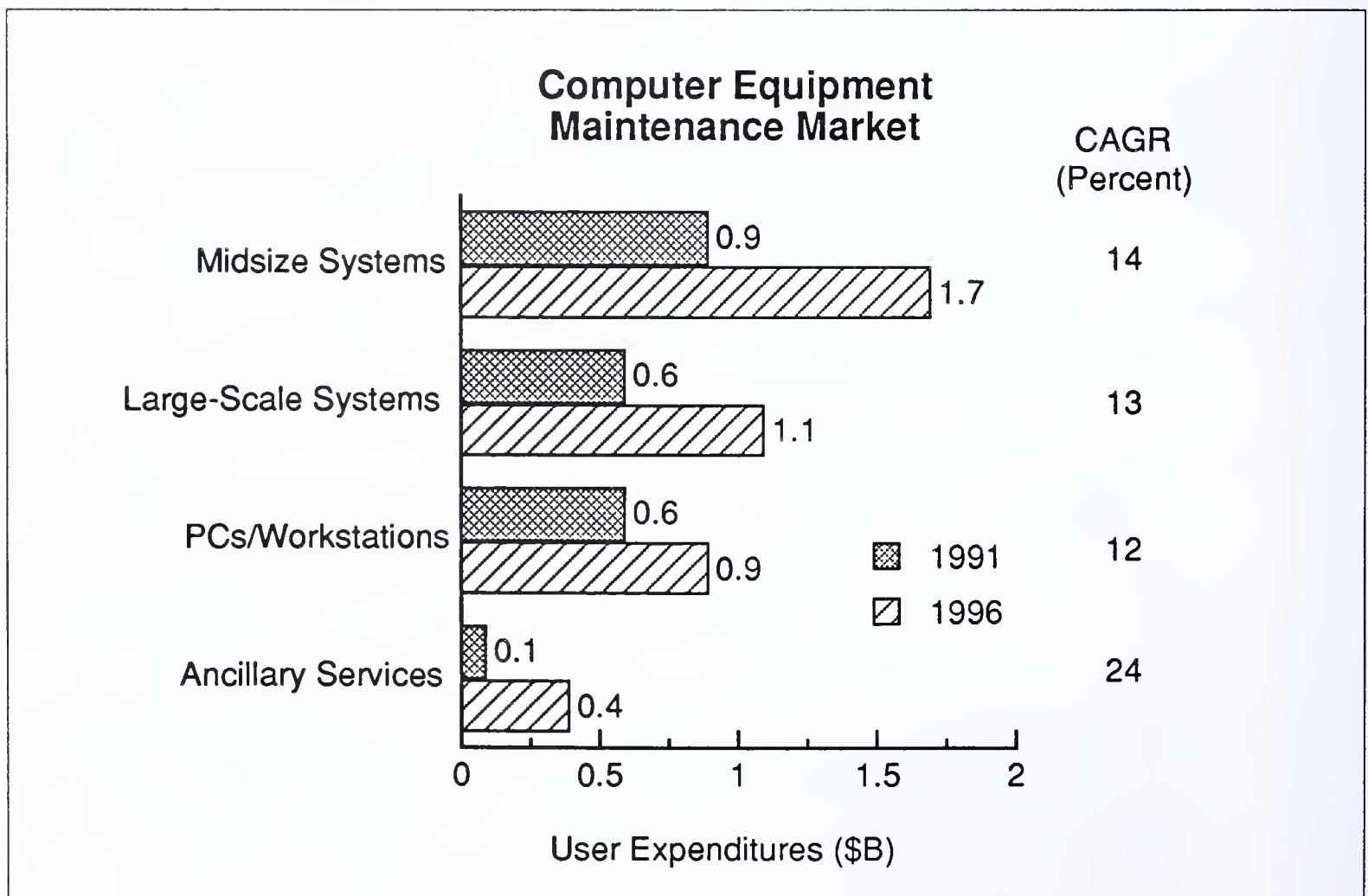
INPUT may not have captured the entire market. Some difficulty was encountered in separating IT maintenance from other non-ADP support functions at contractor-operated government facilities.

It is notable that the largest segment of maintenance is associated with midsize systems, which now represent the largest segment of older ADP equipment in the government inventory of FY 1989. (Refer to the GSA Report for First and Second Quarter, FY 1991 Summary, published by the Federal Equipment Data Center (WKHE). 9,493 units with average age of 12-13 years were reported.)

Despite the large number of PCs and workstations, their very newness results in low demand for maintenance support. Very large systems, including supercomputers, report less than eight years of service for only 271 CPUs. As these increase in age and complexity, the maintenance will increase, at a CAGR of at least 13%.

Recognition of the importance of account control in both the federal and commercial markets is leading to a resurgence of OEMs in this market. Under stricter budget controls, upgrades may be accomplished piecemeal, with potential preeminence of incumbent equipment maintenance firms.

Maintenance of customer-premise equipment in the communications environment was separately treated in that market area. Further investigation of the maintenance market for the FY 1992 report may reveal more details, including specific agency trends and market shares of the leading vendors.

12. Systems Operations

The forecast in this subsection is separate from the professional and processing services subsections. The two modes of COCO and GOCO are combined here to provide a comparison with the commercial outsourcing market. As noted in Exhibit III-22, the federal systems operations expenditures are $1.6 billion in FY 1991 and expected to grow at a CAGR of 9% to $2.5 billion in FY 1996. The growth rate has slowed to 9% from the 15% predicted in 1989 and 13% in 1990.

The SO delivery market turned around in FY 1989 and FY 1990, after 6%-8% CAGRs since FY 1983. The change in budget requests for FY 1989 and FY 1990 responded to restrictions on in-house staffing and new systems implementation imposed by the Gramm-Rudman-Hollings Act and a decline in Defense spending. With release of funding for critical system upgrades and replacement by CIM in FY 1992, the growth of the SO market has again declined to only 9%. The professional services segment (GOCO) will remain about two-thirds of the overall expenditures, growing at the same rate as the processing services segment.

EXHIBIT III-22

Systems Operations Market

CAGR (Percent)

GOCO (Professional Services): 1.2 (1991), 1.9 (1996) — CAGR 9

COCO (Processing Services): 0.4 (1991), 0.6 (1996) — CAGR 9

Legend: 1991, 1996

User Expenditures ($B)
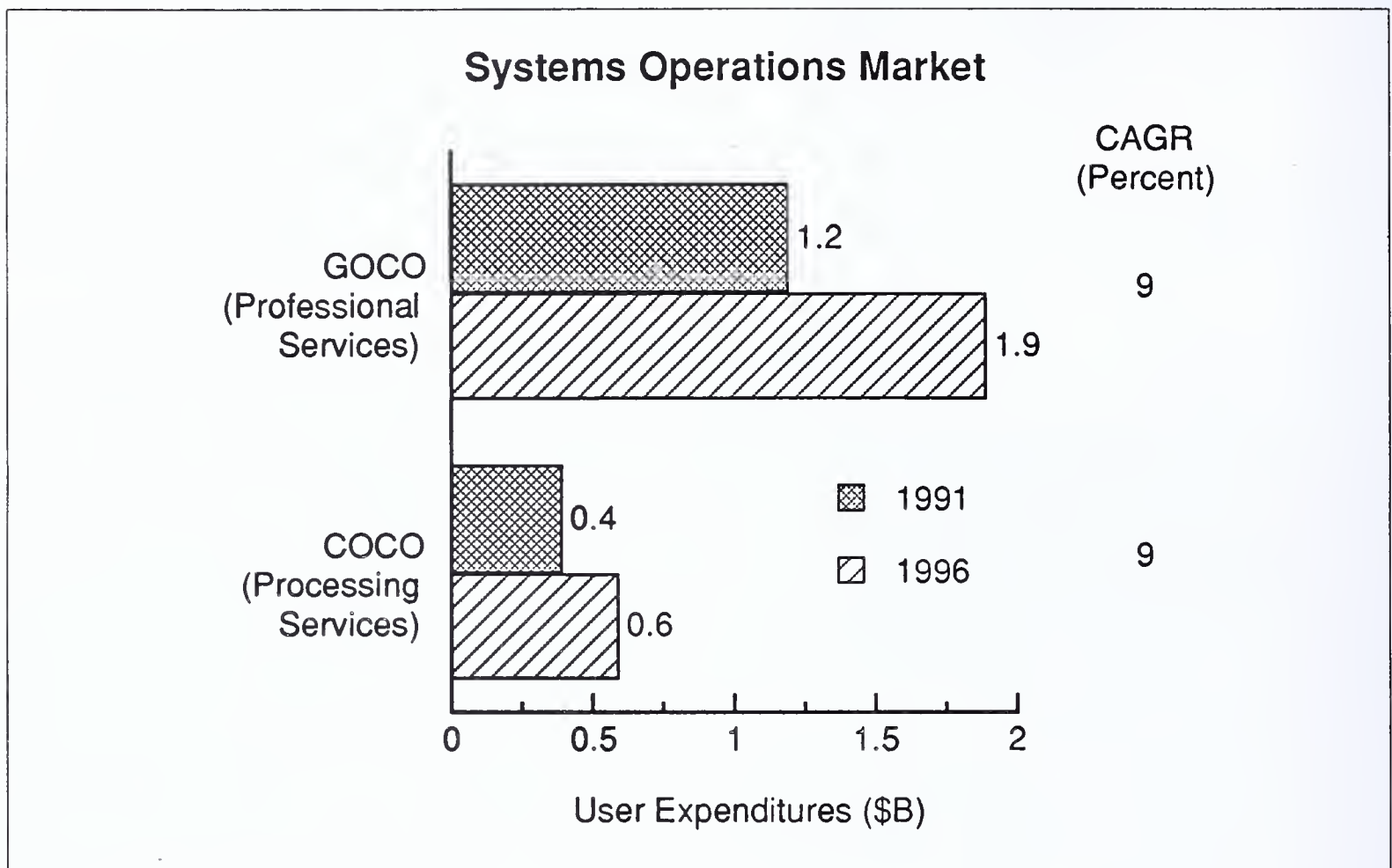
A number of new SO programs have been added to those due to be recompeted in the next few years. The leading COCO program is FAA's CORN, worth $1.5 billion over a ten-year period. Defense projects include Joint Staff Automation and WWMCCS O&M for the Air Force, Laser System Test Facility for the Army, and Navy programs for PMTC Support, Science and Engineering Center Support, and PEPSU Software Maintenance. HHS programs include the Administration and Scientific ADP Services Contract, and Justice has the Automated Litigation Support recompete worth $130 million. The Bureau of Labor Statistics at Labor will recompete the Host Computer Services contract, worth $32 million.

Although industry has used the methodology for years, NASA was the first federal agency to employ mission contracting, now used at all centers except Lewis. The Air Force also uses the same type of contracts for a few centers, and other agencies are moving toward allowing the contractor to use the most efficient staff mix to meet mission data processing and communications requirements.

In addition to the prospect of winning a five-year contract, the next most significant advantage is the opportunity to provide software and hardware add-ons during the contract term. This process is called "flow-through" and enables the incumbent vendor to improve profitability in a delivery mode (GOCO) associated with low fee rates.

Vendors not involved in or allied to another vendor for SI may experience greater competition for the past implementation support. A number of professional service firms are attracted to SI contracts because of SO prospects for five to ten years.

13. Computer Security

INPUT currently expects the market for federal computer security to improve slightly from $580 million in FY 1991 to $725 million in FY 1996, at a compound annual growth rate of 5%, as seen in Exhibit III-23.

Although Congress mandated improved measures in the Computer Security Act of 1987, funding was only provided for development of a security plan and initiation of staff training. Subsequent budget restrictions have further delayed any significant agency responses. Unless Congress passes follow-up legislation, with an appropriate level of funding, it is unlikely that this market will increase substantially. The agencies say that a significant and legally embarrassing incident must occur before the Administration or Congress pay more than lip service to this Act.

The current emphasis is on specialized equipment, comprising about 50% of the FY 1991-1992 outlays. This includes Tempest-shielded and other nonradiating equipment, most of which is detailed on the NSA Preferred Products List (PPL). Criticism about NSA laxity in enforcing its standards led to a new Endorsed Tempest Product List (ETPL) with more stringent standards. The presence of two different lists, some relaxation of Tempest standards, and DoD budget cuts are increasing confusion in this market. The absence of defined penalties adds to the malaise.

Professional services are expected to grow at a CAGR of 5%, from $180 million in FY 1991 to $225 million in FY 1996, providing support in four areas. Under the Computer Security Act, support was and is provided for performing security evaluations and audits, and assisting in development of physical, electronic, and software security plans. While OPM is active in providing computer security training to federal ADP staffs, private sector providers have also been involved. Custom software development and modification help agencies meet their designated security level. For example, IRS hopes to achieve C2-level security with its Tax System Modernization. Systems operations is provided under both the professional services (GOCO) and processing services (COCO) modes. In addition, agencies like NASA have established Computer Security Incident Response teams that include on-site vendor professionals.

EXHIBIT III-23

Computer Security Market

CAGR
(Percent)

Equipment: 365 (1991), 440 (1996) — CAGR 4

Professional Services: 180 (1991), 225 (1996) — CAGR 5

Software Products: 35 (1991), 60 (1996) — CAGR 2

Legend: ▨ 1991   ▨ 1996

User Expenditures ($B)

X-axis: 0 100 200 300 400 500
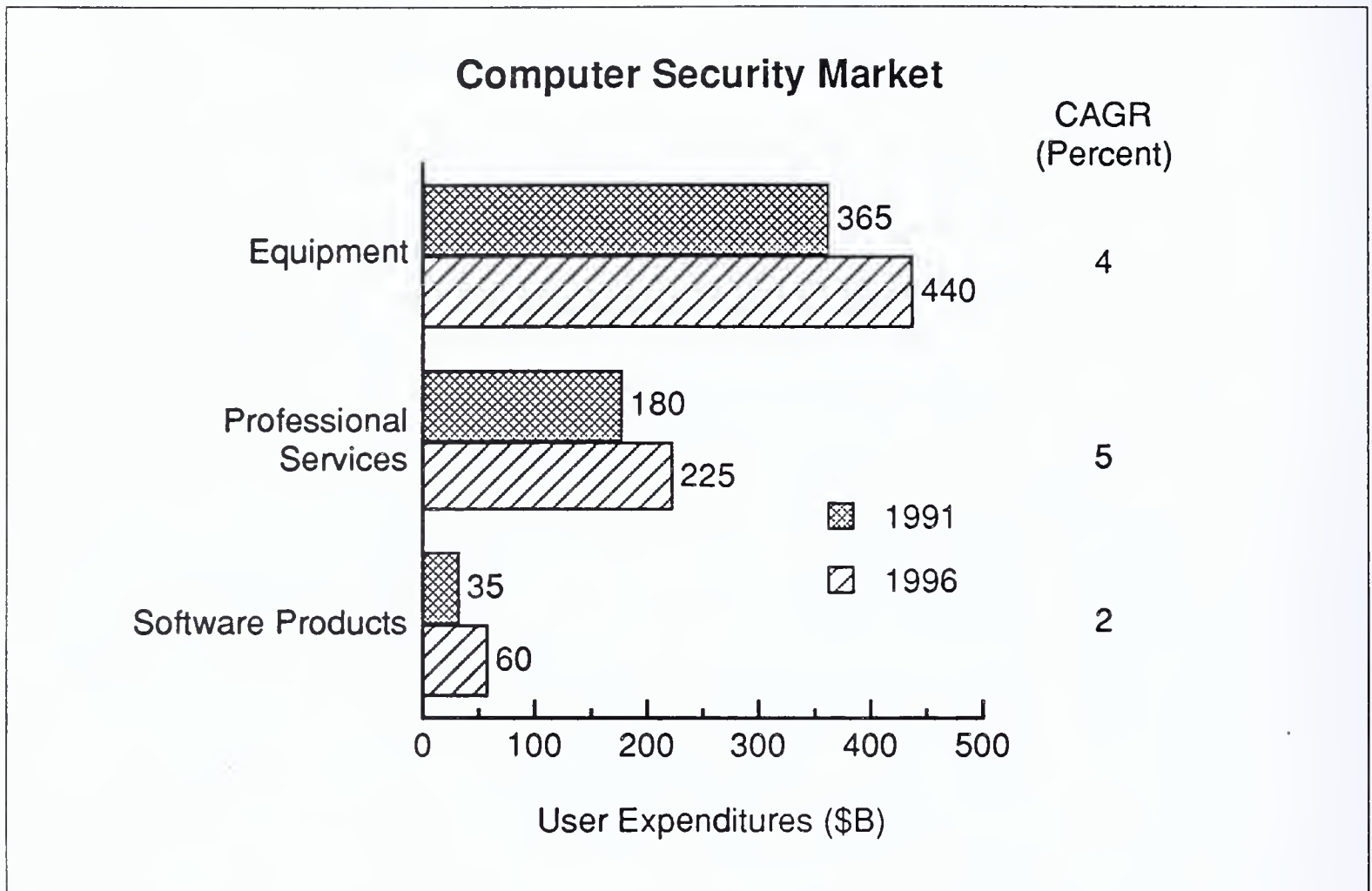
The software products segment is the smallest, expected to experience a CAGR of only 2%. The availability of functional products for defining security needs and providing security measures will affect growth.

Defense and other national security agencies continue to profess an interest in MLS (Multilevel Security) computer systems. Because this is a borderline issue, any acquisitions in this segment are not likely to be given any significant publicity. One vendor has recently announced the availability of an MLS product, without indicating likely sales levels.

Network security, consisting primarily of encryption equipment, is excluded from INPUT's forecast model because of the embedded nature of its processing. However, it still represents a major business opportunity in the federal market. INPUT has sized this market at over $450 million annually and expects it to remain fairly flat over the forecast period. Though demand is increasing, particularly among civilian agencies, the growing cost effectiveness of data encryption equipment is offsetting this growth, leading to the flat market size projection.

D

Major Issues and Driving Forces

1. Major Issues

The federal agencies face several major issues as they move forward to modernize and expand their information systems. These issues are shown in Exhibit III-24. Cost containment will be a key issue to government agencies responding to the combined pressures of Congress and the continuing slowdown in R&D expenditures. Defense, in particular, is experiencing significant budget cuts. Many small vendors with federal contracts see reductions in profits. To keep costs within the government's control, competitors are now required or encouraged to submit fixed-price bids on most systems integration and IS upgrade projects.

EXHIBIT III-24

**Federal Government Sector
Agency Issues**

- Cost containment

- Acquisition reforms

- Budget deficit control measures

- Regulations imposed on agency

- Internal agreement on requirements

- Availability of skilled staff

Several new acquisition, management, and usage procedures have been incorporated into the Federal Information Resource Management Regulations (FIRMRs) and others are still pending. The reforms are intended to streamline the purchasing process while improving the amount of competition. A number of improvement initiatives under way already include:

- "GO FOR 12," a joint agency program to reduce the acquisition process to 12 months

- "TRAIL BOSS," a GSA program for increasing the acquisition authority of selected government program managers and procurement officials. TRAIL BOSS II and TRAIL BOSS III are being offered in 1992.

- "FAR (Federal Acquisition Regulations) Streamline," a new initiative to further reduce the volume of the regulations and employ conventional business terminology

With recent changes in management at GSA, there will likely be further changes in IRM policies and procedures.

Budget deficit control, whether provided under the terms of the Gramm-Rudman-Hollings Act or direct congressional action, is expected to affect the rate and/or extent of IS modernization at the agencies. Continuing economic and political sensitivity to the large national budget deficit could negatively impact a number of acquisitions in the "less-than-critical" defense and civil technology sectors.

Even some programs widely considered critical are taking minor cuts. Major ADP systems already approved, especially those on the Presidential Priority lists, are likely to continue in preference to new and unapproved programs.

The complex and lengthy regulations imposed on the agencies are viewed by many as a severe impediment to systems acquisitions and software development. Combined with a lack of internal concurrence and management interest in extending information automation, these two issues are of concern to the agencies as they plan systems acquisitions and utilization of new information technology.

Furthermore, the federal government does not currently have the requisite level of in-house staff to support the quality or quantity of ADP-supported services mandated by Congress and expected by the American people. The agencies' personnel policies contain outdated standards and job descriptions and impose severe administrative problems. Some resolutions to these problems are being developed. Currently, agencies are working with the Office of Personnel Management to upgrade procurement professionals and give greater support to contracting personnel.

2. Driving Forces

The driving forces behind the federal market for information systems are summarized in Exhibit III-25. The federal government was the first wide-based employer of large data processing capabilities. Despite an inventory in excess of 15,000 systems, not counting microcomputers, current IS resources are experiencing difficulty in meeting rising service demands.

EXHIBIT III-25

Federal Government Sector
Driving Forces

- Rising service demands

- Equipment obsolescence

- High maintenance costs

- End-user computing needs

- Connectivity requirements

- Improved security/privacy demands

- Presidential priority programs

- Public service functions such as social security, welfare, and health and human services continue to escalate under congressional initiatives (although repeal of the Catastrophic Health Insurance Act caused the cancellation of a major network procurement at HCFA).

- Congress needs newer, more frequent, and more timely data and analyses from the departments and agencies it oversees, which would require greater standardization in reporting requirements.

- Administrative initiatives continue to uncover areas of executive branch information processing that are missing or inadequate to meet new management expectations.

Though not as pronounced as in the early 1980s, the ADP equipment (ADPE) inventory still includes a significant number of third-generation machines that lack the flexibility, speed, reliability, and capacity of currently available technologies.

The combination of older ADPE and a very large inventory of custom software has driven maintenance costs up and extended repair times. GAO and NBS have estimated that about 70% of software life cycle costs go to maintenance and enhancement, and tie down an inordinate percent-

age of in-house IS staff. The Defense CIM initiative has as one of its goals the inversion of this cost picture, to reduce maintenance costs to 30% of life cycle costs and free the staff for more productive software applications.

The need to share data under the constraints of the Amended Paperwork Reduction Act and to interact to meet administration requirements (including the Reform '88 and successor initiatives, CALS, and SDI initiatives) will require substantially improved connectivity. New standards are needed for uniform protocols, open system architectures, and standard systems interconnections. However, some resistance continues, especially to GOSIP, as some agencies seek to retain their TCP/IP systems.

Administrative and congressional demands for improved security measures raise national security and individual privacy protection issues. Congress is also considering new computer theft and proprietary data protection measures that will affect commercial and individual privacy as well as national security. However, the consensus of agency respondents is that something drastic will need to happen before IS security is properly funded.

The large number of candidate new and replacement information systems in the procurement process required a priority process to assure completion of those associated with key administrative initiatives. In the fiscal year 1992 budget of the United States Government, Section IX indicates areas of high risk and the Program for Priority Systems (PPS), selected for their size, complexity, and sensitivity. The list includes: IRS Tax Systems Modernization, FTS 2000, SSA Strategic Plan, governmentwide Financial Management System, SEC-EDGAR, FAA Advanced Automation, Defense CIM, Interagency Border Inspection System, and FBI Integrated Automated Fingerprint Identification System.

E

Conclusions

Industry and agencies recognize that a number of factors are slowing the explosive growth in information technology that characterized the 1980s. There appear to be six key factors of the market in this half of the 1990s.

- The pressing need for upgrade or replacement of key information processing systems, especially those under control of CIM in DoD, resulted in greater expenditures in 1991 and higher requests for funding in 1992-1993. Beyond 1993, funding could fall back to the 1989-1990 levels.

EXHIBIT III-26

Conclusions

- Lower growth rates overall

- Data-to-information transition

- Fewer large projects

- Standards implications

- New technology prospects

- Lower growth rates will be experienced overall, but IT will still be given a fairly good share of the federal budget to help agencies meet the growing demands for more flexible and responsive government services. The large cuts in the Defense budget are expected to impact weapons, platforms and facilities, and, ultimately, military personnel staff strengths by as much as 20% of regular forces and 20% of reserve forces. The related reduction in MIL-SPEC IT equipment acquisition may be partially offset by wider use of commercial-grade equipment.

- The federal information technology market of the 1990s will present numerous and varied opportunities for a wide range in size and services for vendors. The complexity and politicization of the process will continue to hinder the effective and efficient acquisition of goods and services by the agencies. But despite these obstacles, the sheer size of the federal market offers the potential of contract revenue to vendors that play the game wisely.

- After more than a decade of indecision by civil agencies about the need for a range of standards, all of the government is rapidly moving to enforcement of standards that will offer interplatform compatibility, applications that are platform-independent and substantially improved for data interchange. Some vendors not geared to provide supplies that meet FIPS-PUBS and NIST security standards will lose market share. Platform acceptance may be tied to qualified software, such as the GSA/JFMIP financial systems schedules.

- The competition in the federal market will continue to evolve as the growth rates and number of significant opportunities decline. Aerospace firms first looked to IT in Defense and now are examining the civil agencies for replacement markets. The large hardware and professional services firms with a strong market position are digging in and slimming down to capture new and recompetitive business. Smaller firms and niche market firms are either forming alliances or moving into the equally depressed commercial market. Competition in this market has become more sophisticated and fierce.

- The federal government has not entirely walked away from support of new information technology offerings. Instead of underwriting development, agencies are now expecting industry to offer demonstrated improvements, COTS/NDI, that will provide enhancements to quality, flexibility, and productivity of processing capabilities that support agency missions. Improvements in artificial intelligence, data base systems, imaging systems, and software tools need to be offered as technology insertions to existing facilities.
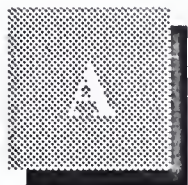
Definitions

The definitions in this appendix include hardware, software, services, and telecommunications categories to accommodate the range of information systems and services programs described in this report.

Alternate service mode terminology employed by the federal government in its procurement process is defined along with INPUT's regular terms of reference, as shown in Exhibit A-1.

The federal government's unique, non-technical terminology, associated with applications, documentation, budgets, authorization, and the procurement/acquisition process, is included in Appendix B, Glossary of Federal Acronyms.

A
Overall Definitions and Analytical Framework

Information Services - Computer/telecommunications-related products and services that are oriented toward the development or use of information systems. Information services typically involve one or more of the following:

- Processing of specific applications using vendor-provided systems (called *Processing Services*)

- A combination of hardware, packaged software and associated support services which will meet a specific application processing need (called *Turnkey Systems*)

- Packaged software (called *Software Products*)

- People services that support users in developing and operating their own information systems (called *Professional Services*)

- Bundled combinations of products and services where the vendor assumes responsibility for the development of a custom solution to an information system problem (called *Systems Integration*)

- Services that provide operation and management of all or a significant part of a user's information systems functions under a long-term contract (called *Systems Operations*)

- Services associated with the delivery of information in electronic form— typically network-oriented services such as value-added networks, electronic mail and document interchange, on-line data bases, on-line news and data feeds, videotex, etc. (called *Network Services*)

In general, the market for information services does not involve providing equipment to users. The exception is where the equipment is bundled as part of an overall service offering such as a turnkey system, a systems operations contract, or a systems integration project.

The information services market also excludes pure data transport services (i.e., data or voice communications circuits). However, where information transport is associated with a network-based service (e.g., EDI or VAN services), or cannot be feasibly separated from other bundled services (e.g., some systems operations contracts), the transport costs are included as part of the services market.

The analytical framework of the *Information Services Industry* consists of the following interacting factors: overall and industry-specific business environment (trends, events and issues); technology environment; user information system requirements; size and structure of information services markets; vendors and their products, services and revenues; distribution channels, and competitive issues.

All *Information Services Market* forecasts are estimates of *User Expenditures* for information services. When questions arise about the proper place to count these expenditures, INPUT addresses them from the user's viewpoint: expenditures are categorized according to what users perceive they are buying.

By focusing on user expenditures, INPUT avoids two problems which are related to the distribution channels for various categories of services:

- Double counting, which can occur by estimating total vendor revenues when there is significant reselling within the industry (e.g., software sales to turnkey vendors for repackaging and resale to end users)

- Missed counting, which can occur when sales to end users go through indirect channels such as mail order retailers.

Delivery Modes are defined as specific products and services that satisfy a given user need. While *Market Sectors* specify *who* the buyer is, *Delivery Modes* specify *what* the user is buying.

Of the eight delivery modes defined by INPUT, five are considered primary products or services:

- Processing Services
- Network Services
- Professional Services
- Applications Software Products
- Systems Software Products

The remaining three delivery modes represent combinations of these products and services, bundled together with equipment, management and/ or other services.

- Turnkey Systems
- Systems Operations
- Systems Integration

Section B describes the delivery modes and their structure in more detail.

Outsourcing is defined as the contracting of information systems (IS) functions to outside vendors. Outsourcing should be viewed as the opposite of *insourcing*: anything that IS management has considered feasible to do internally (e.g., data center operations, applications development and maintenance, network management, training, etc.) is a potential candidate for outsourcing.

IS has always bought systems software, as it is infeasible for companies to develop it internally. However, all other delivery modes represent functions or products that IS management could choose to perform or develop in-house. Viewed this way, outsourcing is the result of a make-or-buy decision, and the outsourcing market covers any product or service where the vendor must compete against the client firm's own internal resources.

B

Industry Structure and Delivery Modes

1. Services Categories

Exhibit A-1 presents the structure of the information services industry. Several of the delivery modes can be grouped into higher-level *Service Categories,* based on the kind of problem the user needs to solve. These categories are:

- *Business Application Solutions (BAS)* - prepackaged or standard solutions to common business applications. These applications can be either industry-specific (e.g., mortgage loan processing for a bank), cross-industry (e.g., payroll processing), or generic (e.g., utility time

EXHIBIT A-1

Information Services Industry Structure—1991

Information Services Industry

Systems Management Services

- Systems Integration
  - Equipment
  - Software
  - Prof. Svcs.
  - Other
- Systems Operations
  - Processing Services
  - Professional Services
- Professional Services
  - Consulting
  - Education & Training
  - Software Development
- Network Services
  - Electronic Information Services
    - Data Bases
    - News
  - Network Applications
    - VANs
    - EDI
    - Electronic Mail
- Systems Software
  - Mainframe
  - Midsize
  - Workstation
  - PC

Business Application Solutions

- Applications Software
  - Mainframe
  - Midsize
  - Workstation
  - PC
- Turnkey Systems
  - Equipment
  - Software
  - Prof. Svcs.
- Processing Services
  - Transaction
  - Utility
  - Other

Source: INPUT

sharing). In general, BAS services involve minimal customization by the vendor, and allow the user to handle a specific business application without having to develop or acquire a custom system or system resources. The following delivery modes are included under BAS:

- Processing Services
- Applications Software Products
- Turnkey Systems

- *Systems Management Services (SMS)* - services which assist users in developing systems or operating/managing the information systems function. Two key elements of SMS are the customization of the service to each individual user and/or project, and the potential for the vendor to assume significant responsibility for management of at least a portion of the user's information systems function. The following delivery modes are included under SMS:

- Systems Operations
- Systems Integration

Each of the remaining three delivery modes represent a separate service category:

- Professional Services
- Network Services
- Systems Software Products

Note: These service categories are a new concept introduced in 1990. They are purely an aggregation of lower-level delivery mode data. They do not change the underlying delivery modes or industry structure.

2. Software Products

There are many similarities between the applications and systems software delivery modes. Both involve user purchases of software packages for in-house computer systems. Included are both lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement or maintain the package at the user's site. Vendor-provided training or support in operation and user of the package, if bundled in the software pricing, is also included here.

Expenditures for work performed by organizations other than the package vendor are counted in the category of professional services. Fees for work related to education, consulting, and/or custom modification of software products are counted as professional services, provided such fees are charged separately from the price of the software product itself.

Software products have several subcategories, as indicated below and shown in Exhibit A-2.

- Systems Software Products

  Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. These products include:

  - *Systems Control Products* - Software programs that function during application program execution to manage computer system resources and control the execution of the application program. These products include operating systems, emulators, network control, library control, windowing, access control, and spoolers.

  - *Operations Management Tools* - Software programs used by operations personnel to manage the computer system and/or network resources and personnel more effectively. Included are performance measurement, job accounting, computer operation scheduling, disk management utilities, and capacity management.

  - *Applications Development Tools* - Software programs used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Included are traditional programming languages, 4GLs, data dictionaries, data base management systems, report writers, project control systems, CASE systems, and other development productivity aids. Also included are system utilities (e.g., sorts) which are directly invoked by an applications program.

- Applications Software Products

  - *Industry-Specific Applications Software Products* - Software products that perform functions related to solving business or organizational needs unique to a specific vertical market and sold to that market only. Examples include demand deposit accounting, MRPII, medical recordkeeping, automobile dealer parts inventory, etc.

  - *Cross-Industry Applications Software Products* - Software products that perform a specific function that is applicable to a wide range of industry sectors. Applications include payroll and human resource systems, accounting systems, word processing and graphics systems, spreadsheets, etc.

EXHIBIT A-2

Software Products

Systems Software

Systems Control

- Access Control
- Communications Monitors
- Encription Systems
- Operating Systems
- Point-to-Point Control
- System Library Control
- Other

Data Center Management

- Capacity Management
- Computer Operations Scheduling
- Data Center Management
- Downtime/Repair Monitoring Management
- Job Accounting
- Performance Monitors
- Tape Management
- Utilities
- Other

Data Base Management Systems

- Data Base Management Systems
- Data Dictionaries
- Other

Applications Development

Program Development and Production Tools

- Application Generators
- Assemblers
- Automatic Documentation
- Compilers
- Debugging Aids
- Languages
- Project Control and Management Systems
- Retrieval Systems
- Spreadsheet Systems
- Translators
- Others

EXHIBIT A-2 (CONT.)

Software Products (Cont.)

Applications Software

Cross-Industry

Accounting
- Accounts Payable
- Accounts Receivable
- Fixed Assets
- General Ledger
- Purchasing
- Other

Human Resources
- Benefits
- Payroll
- Personnel
- Training and Education
- Other

Information Analysis
- Budgeting
- Decision Support Systems
- Financial Planning
- Forecasting
- Modeling
- Other

Logistics Distribution
- Distribution Accounting
- Inventory
- Invoicing/Billing
- Mailing List
- Order Entry
- Procurement
- Other

Word Processing
- Document Generators
- Text Editors
- Word Processing
- Others

Graphics
- Character Graphics
- Line Graphics
- Picture Graphics
- Others

Other
- Administrative Services
- Executive Services
- Operations Services
- Project Control and Planning
- Scientific Engineering and Technical Support
- Other

Industry-Specific
- Education
- Federal Government
- Insurance
- Medical
- Process Manufacturing
- Services
- State and Local Government
- Transportation
- Utilities
- Other
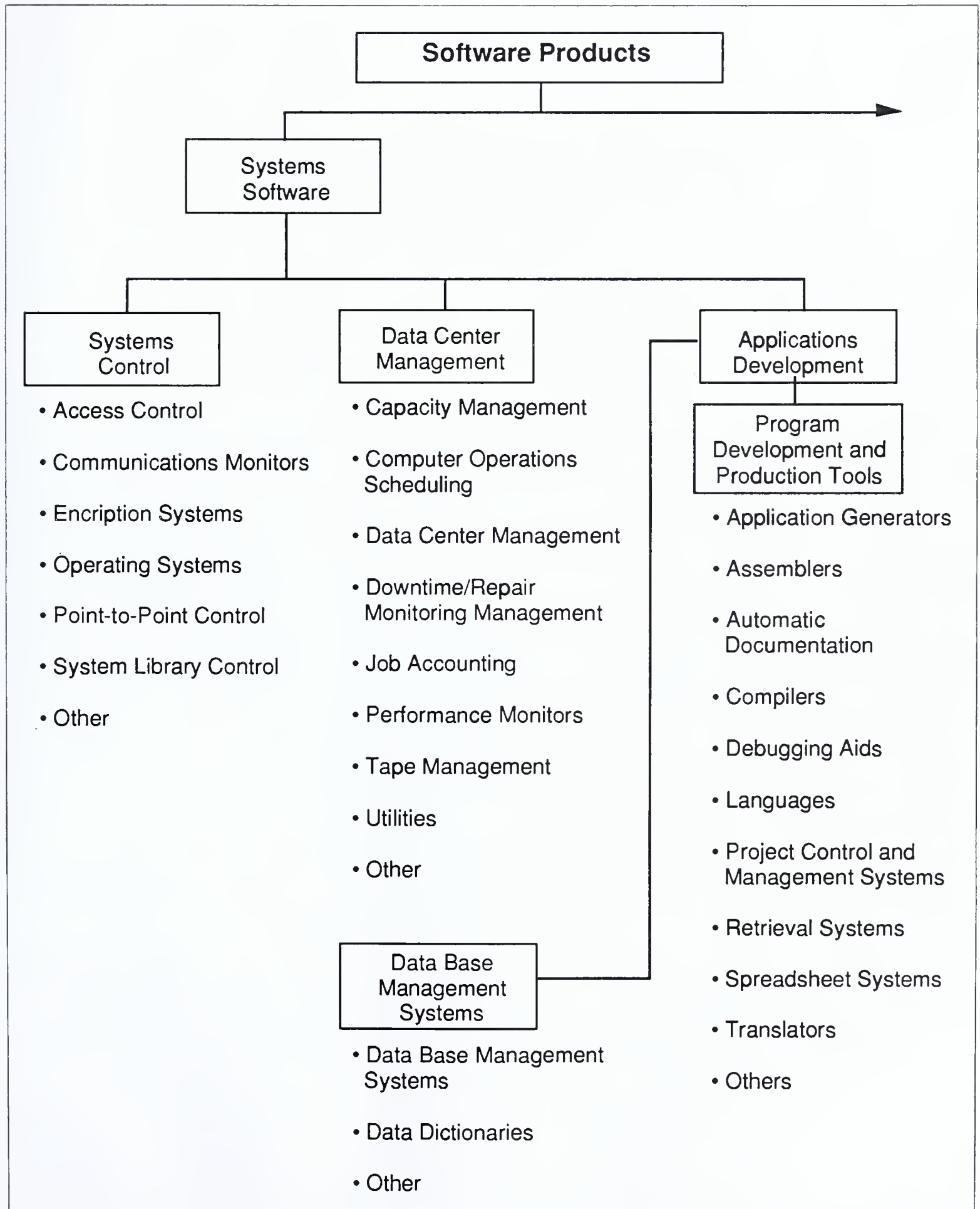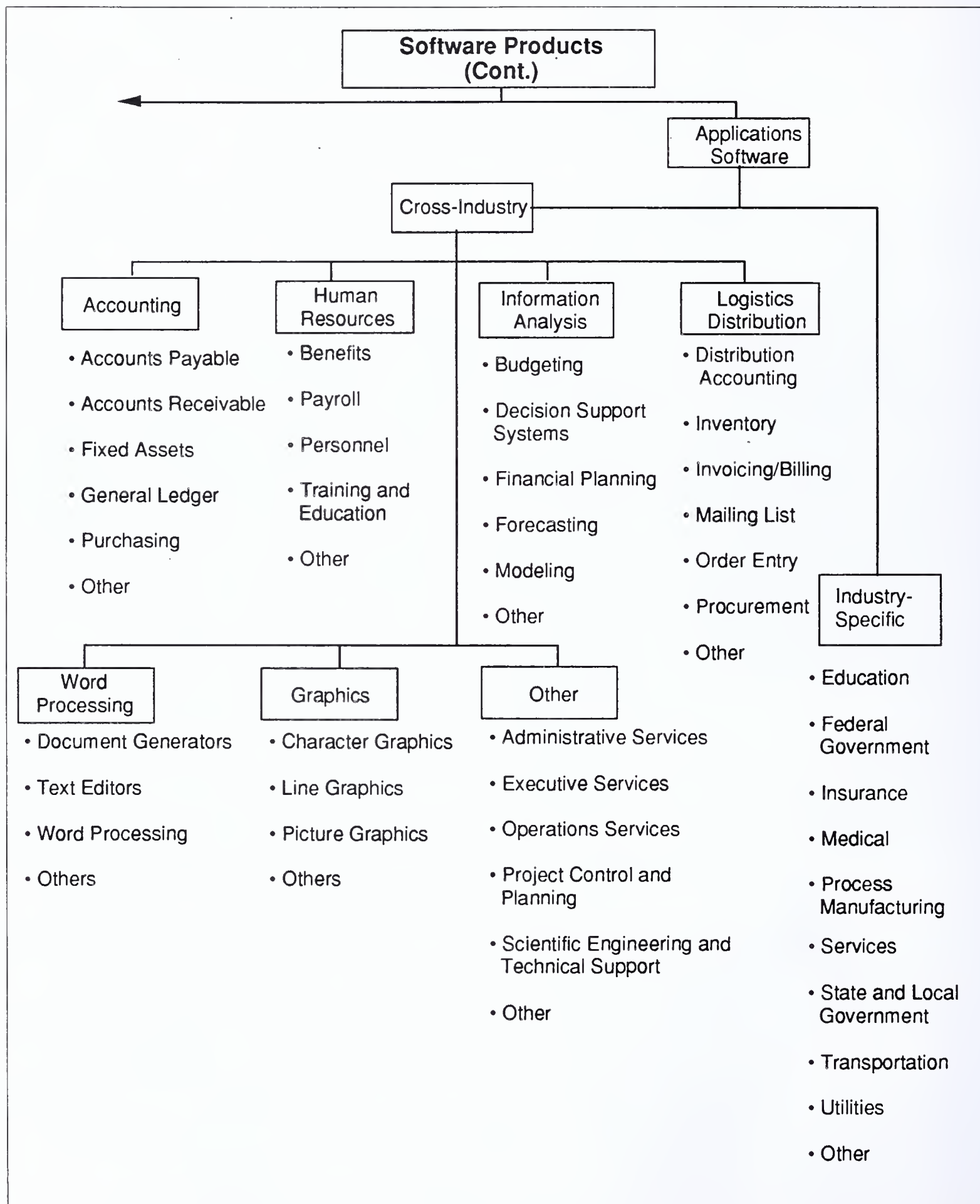
A-8

3. Turnkey Systems

A turnkey system is an integration of equipment (CPU, peripherals, etc.), systems software, and packaged or custom application software into a single system developed to meet a specific set of user requirements. Value added by the turnkey system vendor is primarily in the software and support services provided. Most CAD/CAM systems and many small business systems are turnkey systems. Turnkey systems utilize standard computer and do not include specialized hardware such as word processors, cash registers, process control systems, or embedded computer systems for military applications.

Hardware vendors that combine software with their own general-purpose hardware are not classified by INPUT as turnkey vendors. Their software revenues are included in the appropriate software category.

Most turnkey systems are sold through channels known as value-added resellers.

- Value-Added Reseller (VAR): A VAR adds value to computer hardware and/or software and then resells it to an end user. The major value added is usually application software for a vertical or cross-industry market, but also includes many of the other components of a turnkey systems solution, such as professional services.

Turnkey systems are divided into two categories:

- *Industry-Specific Systems* - systems that serve a specific function for a given industry sector, such as automobile dealer parts inventory, medical recordkeeping, or discrete manufacturing control systems.

- *Cross-Industry Systems* - systems that provide a specific function that is applicable to a wide range of industry sectors, such as financial planning systems, payroll systems, or personnel management systems.

4. Processing Services

This category includes transaction processing, utility processing, and other processing services.

- *Transaction Processing*: Client uses vendor-provided information systems—including hardware, software and/or data networks—at vendor site or customer site to process transactions and update client data bases. Transactions may be entered in one of four modes:

- *Interactive* - Characterized by the interaction of the users with the system for data entry, transaction processing, problem solving and report preparation: the user is on-line to the programs/files stored on the vendor's system.

- *Remote Batch* - Where the user transmits batches of transaction data to the vendor's system, allowing the vendor to schedule job execution according to overall client priorities and resource requirements.

- *Distributed Services* - Where users maintain portions of an application data base and enter or process some transaction data at their own site, while also being connected through communications networks to the vendor's central systems for processing other parts of the application.

- *Carry-in Batch* - where users physically deliver work to a processing services vendor.

- *Utility Processing:* Vendor provides basic software tools (language compilers, assemblers, DBMSs, graphics packages, mathematical models, scientific library routines, etc.), generic applications programs and/or data bases, enabling clients to develop their own programs or process data on vendor's system.

- *Other Processing Services:* Vendor provides services—usually at vendor site—such as scanning and other data entry services, laser printing, computer output microfilm (COM), CD preparation and other data output services, backup and disaster recovery, etc.

5. Systems Operations

Systems operations involves the operation and management of all or a significant part of the user's information systems functions under a long-term contract. These services can be provided in either of two distinct submodes:

- *Professional Services:* The vendor provides personnel to operate client-supplied equipment. Prior to 1990, this was a submode of the Professional Services delivery mode.

- *Processing Services:* The vendor provides personnel, equipment and (optionally) facilities. Prior to 1990, this was a submode of the Processing Services delivery mode.

Systems operations vendors now provide a wide variety of services in support of existing information systems. The vendor can plan, control, provide, operate, maintain and manage any or all components of the user's information systems (equipment, networks, systems and/or application software), either at the client's site or the vendor's site. Systems operations can also be referred to as "resource management" or "facilities management".

There are two general levels of systems operations:

- Platform/network operations - where the vendor operates the computer system and/or network without taking responsibility for the applications

- Application operations - where the vendor takes responsibility for the complete system, including equipment, associated telecommunications networks, and applications software.

Note: Systems Operations is a new delivery mode introduced in 1990.

6. Systems Integration (SI)

Systems integration is a business offering that provides a complete solution to an information system, networking or automation requirements through the custom selection and implementation of a variety of information system products and services. A systems integrator is responsible for the overall management of a systems integration contract and is the single point of contact and responsibility to the buyer for the delivery of the specified system function, on schedule and at the contracted price.

To be included in the information services market, systems integration projects must involve some application processing component. In addition, the majority of cost must be associated with information systems products and/or services.

The systems integrator will perform, or manage others who perform, most or all of the following functions:

- Program management, including subcontractor management

- Needs analysis

- Specification development

- Conceptual and detailed systems design and architecture

- System component selection, modification, integration and customization

- Custom software design and development

- Custom hardware design and development

- Systems implementation, including testing, conversion and post-implementation evaluation and tuning

- Life cycle support, including

    - System documentation and user training
    - Systems operations during development
    - Systems maintenance

- Financing

7. Professional Services

This category includes consulting, education and training, and software development.

- *Consulting:* services include management consulting (related to information systems), information systems consulting, feasibility analysis and cost-effectiveness studies, and project management assistance. Services may be related to any aspect of information systems, including equipment, software, networks and systems operations.

- *Education and Training*: Products and services related to information systems and services for the professional end user, including computer-aided instruction, computer-based education, and vendor instruction of user personnel in operations, design, programming, and documentation.

- *Software Development*: Services include user requirements definition, systems design, contract programming, documentation and implementation of software performed on a custom basis. Conversion and maintenance services are also included.

8. Network Services

Network services typically include a wide variety of network-based functions and operations. Their common thread is that most of these functions could not be performed without network involvement. Network services is divided into two major segments: Electronic Information Services, which involve selling information to the user, and Network Applications, which involve providing some form of enhanced transport service in support of a user's information processing needs.

- Electronic Information Services

Electronic information services are data bases that provide specific information via terminal- or computer-based inquiry, including items such as stock prices, legal precedents, economic indicators, periodical literature, medical diagnosis, airline schedules, automobile valuations, etc. The terminals used may be computers themselves, such as communications servers or personal computers. Users typically inquire into and extract information from the data bases. Although users may load extracted data into their own computer systems, the electronic information vendor provides no data processing or manipulation capability and the users cannot update the vendor's data bases.

The two kinds of electronic information services are:

- *On-line Data Bases* - Structured, primarily numerical data on economic and demographic trends, financial instruments, companies, products, materials, etc.

- *News Services* - Unstructured, primarily textual information on people, companies, events, etc.

While electronic information services have traditionally been delivered via networks, there is a growing trend toward the use of CD ROM optical disks to support or supplant on-line services, and these optical disk-based systems are included in the definition of this delivery mode.

- *Network Applications*

  - *Value-Added Network Services (VAN Services)* - VAN services are enhanced transport services which involve adding such functions as automatic error detection and correction, protocol conversion, and store-and-forward message switching to the provision of basic network circuits.

While VAN services were originally provided only by specialized VAN carriers (Tymet, Telenet, etc.), today these services are also offered by traditional common carriers (AT&T, Sprint, etc.). Meanwhile, the VAN carriers have also branched into the traditional common carriers' markets and are offering unenhanced basic network circuits as well.

INPUT's market definition covers VAN services only, but includes the VAN revenues of all types of carriers.

- *Electronic Data Interchange (EDI)* - Application-to-application exchange of standardized business documents between trade partners or facilitators. This exchange is commonly performed using VAN services. specialized translation software is typically employed to convert data from organizations' internal file formats to EDI interchange standards; this software may be provided as part of the VAN service, or may be resident on the organization's own computers.

- *Electronic Information Exchange (EIE)* - Also known as Electronic Mail (E-Mail), EIE involves the transmission of messages across an electronic network managed by a services vendor, including facsimile transmission (FAX), voice mail, voice messaging, and access to Telex, TWX, and other messaging services. This also includes bulletin board services.

- *Other Network Services* - This segment contains videotex and pure network management services. Videotex is actually more a delivery mode than an application. Its prime focus is on the individual as a consumer or in business. These services provide interactive access to data bases and offer the inquirer the capability to send as well as receive information for such purposes as home shopping, home banking, travel reservations, and more.

Network management services included here must involve the vendor's network and network management systems as well as people. People-only services, or services that involve the management of networks as part of the broader task of managing a user's information processing functions are included in Systems Operations.

C

Hardware/Hardware Systems

Hardware - Includes all computer and telecommunications equipment that can be separately acquired with or without installation by the vendor and not acquired as part of an integrated system.

- *Peripherals* - Includes all input, output, communications, and storage devices (other than main memory) that can be connected locally to the main processor, and generally cannot be included in other categories such as terminals.

- *Input Devices* - Includes keyboards, numeric pads, card readers, light pens and track balls, tape readers, position and motion sensors, and analog-to-digital converters.

- *Output Devices* - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters

- *Communication Devices* - Includes modem, encryption equipment, special interfaces, and error control

- *Storage Devices* - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, solid state (integrated circuits), and bubble and optical memories

Terminals - Three types of terminals are described below:

- *User Programmable* - Also called intelligent terminals, including the following:

  - Single-station or standalone
  - Multistation, shared processor
  - Teleprinter
  - Remote batch

- User Nonprogrammable

  - Single-station
  - Multistation, shared processor
  - Teleprinter

- *Limited Function* - Originally developed for specific needs, such as point-of-sale (POS), inventory data collection, controlled access, and other applications

Hardware Systems - Includes all processors from microcomputers to supercomputers. Hardware systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices, other than main memory and processors or CPUs not provided as part of an integrated (turnkey) system.

- *Microcomputer* - Combines all of the CPU, memory, and peripheral functions of an 8-, 16-, or 32-bit computer on a chip in various forms including:

  - Integrated circuit package

  - Plug-in boards with increased memory and peripheral circuits

  - Console including keyboard and interfacing connectors

  - Personal computer with at least one external storage device directly addressable by the CPU

  - An embedded computer which may take a number of shapes or configurations

- *Workstations* - High-performance, desktop, single-user computers employing (mostly) Reduced Instruction Set Computing (RISC). Workstations provide integrated, high-speed, local network-based services such as data base access, file storage and back-up, remote communications, and peripheral support. Typical workstation products are provided by Apollo (now a unit of Hewlett-Packard), Sun, Altos, DEC (the MicroVAX) and IBM. These products usually cost more than $15,000. However, at this writing many companies have recently announced sizable price cuts.

• *Midsize Systems* - Describe superminicomputers and the more traditional business minicomputers. Due to steadily improving design and technology, the latter have outgrown traditional definitions (which defined small systems as providing 32-bit to 64-bit word lengths at prices ranging from $15,000 to $350,000). Increasingly, minicomputers and workstations meet the 32-bit definition, and may go beneath the $15,000 lower price limit. Typical midrange systems include IBM System/3X, 43XX, AS/400, and 937X product lines, DEC PDP and VAX families (excluding MicroVAX families), and competitive products from a wide range of vendors, including HP, Data General, Wang, AT&T, Prime Concurrent, Gould, Unisys, NCR, Bull, Harris, Tandem, Stratus, and many others.

• *Large Computer* - Presently centered on storage controllers, but likely to become bus-oriented and to consist of multiple processors or parallel processor. Intended for structured mathematical and signal processing and typically used with general purpose, Von Neumann-type processors for system control. This term usually refers to traditional mainframes and supercomputers.

• *Supercomputer* - High-powered processors with numerical processing throughput that is significantly greater than the fastest general purpose computers, with capacities in the 100-500 million floating point operations per second (MFLOPS) range. Newer supercomputers, with burst modes over 500 MFLOPS, main storage size up to 10 million words, and on-line storage in the one-to-four gigabyte class, are labeled Class V to Class VII in agency long-range plans. Supercomputers fit in one of two categories:

  - Real Time - Generally used for signal processing in military applications

  - Non-Real Time - For scientific use in one of three configurations:

    · Parallel processors
    · Pipeline processor
    · Vector processor

  - *Supercomputer* - Is also applied to micro, mini, and large mainframe computers with performance substantially higher than attainable by Von Neumann architectures.

• *Embedded Computer* - Dedicated computer system designed and implemented as an integral part of a weapon, weapon system, or platform; critical to a military or intelligence mission such as command and control, cryptological activities, or intelligence activities. Characterized by military specifications (MIL SPEC) appearance and operation,

limited but reprogrammable applications software, and permanent or semipermanent interfaces. These systems may vary in capacity from microcomputers to parallel processor computer systems.

D

General Definitions

Analog - Signal or transmission type with continuous waveform representation.

ASCII - American National Standard Code for Information Interchange—Eight-bit code with seven data bits and one parity bit.

Asynchronous - Communications operation (such as transmission) without continuous timing signals. Synchronization is accomplished by appending signal elements to the data.

Bandwidth - Range of transmission frequencies that can be carried on a communications path; used as a measure of capacity.

Baud - Number of signal events (discrete conditions) per second. Typically used to measure modem or terminal transmission speed.

Byte - Usually equivalent to the storage required for one alphanumeric character (i.e., one letter or number).

CBX - Computerized Branch Exchange—A PABX based on a computer system, implying programmability and usually voice and data capabilities.

Central Processing Unit (CPU) - The arithmetic and control portion of a computer; i.e., the circuits controlling the interpretation and execution of computer instructions.

Centrex - Central office telephone services that permit local circuit switching without installation of customer premises equipment. Could be described as shared PBX service.

Circuit Switching - A process that, usually on demand, connects two or more network stations, and permits exclusive circuit use until the connection is released; typical of the voice telephone network, where a circuit is established between the caller and the called party.

CO - Central Office—Local telco site for one or more exchanges.

CODEC - Coder/decoder—Equivalent to modem for digital devices.

Constant Dollars - Growth forecasts in constant dollars make no allowance for inflation or recession. Dollar value based on the year of the forecast unless otherwise indicated.

Computer System - The combination of computing resources required to perform the designed functions. May include one or more CPUs, machine room peripherals, storage systems, and/or applications software.

CPE - Customer Premises Equipment—DCE or DTE located at a customer site rather than at a carrier site such as the local telephone company CO. May include switchboards, PBX, data terminals, and telephone answering devices.

CSMA/CD - Carrier Sense Multiple Access/Collision Detect—Contention protocol used in local-area networks, typically with a multipoint configuration.

Current Dollars - Estimates or values expressed in current-year dollars which, for forecasts, would include an allowance for inflation.

Data Encryption Standard (DES) - Fifty-six-bit key, one-way encryption algorithm adopted by NIST in 1977, implemented through hardware ("S-boxes") or software. Designed by IBM with NSA guidance.

Datagram - A self-contained packet of information that does not depend on the contents of preceding or following packets and has a finite length.

DCA - IBM's Document Content Architecture—Protocols for specifying document (text) format which are consistent across a variety of hardware and software systems within IBM's DISOSS.

DCE - Data Circuit-terminating Equipment—Interface hardware that couples DTE to a transmission circuit or channel by providing functions to establish, maintain, and terminate a connection, including signal conversion and coding.

DDCMP - Digital Data Communications Message Protocol—Data link protocol used in Digital Equipment Company's DECNET.

DECNET - Digital Equipment Company's network architecture.

Dedicated Circuit - A permanently established network connection between two or more stations; contrast with switched circuit.

DEMS - Digital Electronic Message Service—Nationwide common carrier digital networks which provide high-speed, end-to-end, two-way transmission of digitally encoded information using the 10.6 GHz band.

DIA - IBM's Document Interchange Architecture—Protocols for transfer of documents (text) between different hardware and software systems within IBM's DISOSS.

Digital - Signal or transmission type using discontinuous, discrete quantities to represent data.

DISOSS - IBM's DIStributed Office Support System—Office automation environment, based on DCA and DIA, which permits document (text) transfer between different hardware and software systems without requiring subsequent format or content revision.

Distributed Data Processing - The development of programmable intelligence in order to perform a data processing function where it can be accomplished most effectively through computers and terminals arranged in a telecommunications network adapted to the user's needs.

DTE - Data Terminal Equipment—Hardware which is a data source, link, or both, such as video display terminals that convert user information into data transmission, and reconvert data signals into user information.

EBCDIC - Extended Binary Coded Decimal Interchange Code—Eight-bit code typically used in IBM mainframe environments.

EFT - Electronic funds transfer.

Encryption - Electric, code-based conversion of transmitted data to provide security and/or privacy of data between authorized access points.

End User - One who is using a product or service to accomplish his or her own functions. The end user may buy a system from the hardware supplier(s) and do his or her own programming, interfacing, and installation. Alternately, the end user may buy a turnkey system from a systems house or hardware integrator, or may buy a service from an in-house department or external vendor.

Engineering Change Notice (ECN) - Product improvements after production.

Engineering Change Order (ECO) - The follow-up to ECNs, including parts and a bill of materials to effect the change in the hardware.

Equipment Operators - Individuals operating computer control consoles and/or peripheral equipment (BLS definition).

Erasable Disk - A type of disk that allows users to erase data previously written. Erasable disks used for applications where data may need to be updated periodically.

Ethernet - Local-area network developed by Xerox PARC using baseband signaling, CSMA/CD protocol, and coaxial cable to achieve a 10 mbps data rate.

Facsimile - Transmission and reception of graphic data, usually fixed images of documents, through scanning and conversion of a picture signal.

FDM - Frequency Division Multiplexing—A multiplexing method that permits multiple access by assigning different frequencies of the available bandwidth to different channels.

FEP - Front-End Processor—Communications concentrator such as the IBM 3725 or COMTEN 3690 used to interface communications lines to host computers.

Field Engineer (FE) - Field engineer, customer engineer, serviceperson, and maintenance person are used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

Full-Duplex - Bi-directional communications, with simultaneous, two-way transmission.

General Purpose Computer System - A computer designed to handle a wide variety of problems. Includes machine room peripherals, systems software, and small business systems.

Half-Duplex - Bi-directional communications, but only in one direction at a time.

Hardware Integrator - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. The hardware integrator also may develop control system software in addition to installing the entire system at the end-user site.

HDLC - High-level Data Link Control.

Hertz- Number of signal oscillations (cycles) per second, abbreviated Hz.

IBM Token Ring - IBM's local-area network using baseband signalling and operating at 4 mbps on twisted-pair copper wire. Actually a combination of star and ring topologies—IEEE 802.5-compatible.

IDN - Integrated Digital Network—Digital switching and transmission; part of the evolution to ISDN.

Independent Suppliers - Suppliers of machine room peripherals, though usually not suppliers of general purpose computer systems.

Information Processing - Data processing as a whole, including use of business and scientific computers.

Installed Base - Cumulative number or value (cost when new) of computers in use.

Interconnection - Physical linkage between devices on a network.

Interoperability - The capability to operate with other devices on a network. Different from interconnection, which merely guarantees a physical network interface.

ISDN - Integrated Services Digital Network—Completely digital, integrated voice and nonvoice public network service. Not clearly defined through any existing standards, although FCC and other federal agencies are developing CCITT recommendations.

Keypunch Operators - Individuals operating keypunch machines (similar to electric typewriters) to transcribe data from source materials onto punch cards.

Lease Line - Permanent connection between two network stations. Also known as dedicated or non-switched line.

Machine Repairers - Individuals who install and periodically service computer systems.

Machine Room Peripherals - Peripheral equipment generally located close to the central processing unit.

Mainframe - The central processing unit (CPU or units in a parallel processor) of a computer that interprets and executes computer (software) instructions of 32 bits or more.

MAP - Manufacturing Automation Protocol—Seven-layer communications standard for factory environments promoted by General Motors/EDS. Adopts IEEE 802.2 and IEEE 802.4 standards plus OSI protocols for other layers of the architecture.

Mean Time to Repair - The mean of elapsed times from the arrival of the field engineer on the user's site to the time when the device is repaired and returned to user service.

Mean Time to Respond - The mean of elapsed times from the user call for services and the arrival of the field engineer on the user's site.

Message - A communication intended to be read by a person. The quality of the received document need not be high, only readable. Graphic materials are not included.

MMFS - Manufacturing Messaging Format Standard—Application-level protocol included within MAP.

Modem - A device that encodes information into electronically transmittable form (MOdulator) and restores it to original analog form (DEModulator).

NCP - Network Control Program—Software used in IBM 3705/3725 FEPs for control of SNA networks.

Node - Connection point of three or more independent transmission points which may provide switching or data collection.

Off-Line - Pertaining to equipment or devices that can function without direct control of the central processing unit.

On-Line - Pertaining to equipment or devices under direct control of the central processing unit.

Optical Disk - Storage device that uses laser technology to record data. Optical disks provide high storage capacity, but cannot be overwritten.

OSI - ISO reference model for Open Systems Interconnection—Seven-layer architecture for application, presentation, session, transport, network, data link, and physical services and equipment.

OSI Application Layer - Layer 7, providing end-user applications services for data processing.

OSI Data Link Layer - Layer 2, providing transmission protocols, including frame management, link flow control, and link initiation/release.

OSI Network Layer - Layer 3, providing call establishment and clearing control through the network nodes.

OSI Physical Layer - Layer 1, providing the mechanical, electrical, functional, and procedural characteristics to establish, maintain, and release physical connections to the network.

OSI Presentation Layer - Layer 6, providing data formats and information such as data translation, data encoding/decoding, and command translation.

OSI Session Layer - Layer 5, establishes, maintains, and terminates logical connections for the transfer of data between processes.

OSI Transport Layer - Layer 4, providing end-to-end terminal control signals such as acknowledgments.

Overseas - Not within the geographical limits of the continental United States, Alaska, Hawaii, and U.S. possessions.

PABX - Private Automated Branch Exchange—Hardware that provides automatic (electro-mechanical or electronic) local circuit switching on a customer's premises.

PAD - Packet Assembler-Disassembler—A device that enables DTE not equipped for packet switching operation to operate on a packet switched network.

PBX - Private Branch Exchange—Hardware that provides local circuit switching on the customer premise.

PCM - Pulse-Code Modulation—Modulation involving conversion of a waveform from analog to digital form through coding.

PDN - Public Data Network—A network established and operated by a recognized private operating agency, a telecommunications administration, or other agency for the specific purpose of providing data transmission services to the public.

Peripherals - Any unit of input/output equipment in a computer system, exclusive of the central processing unit.

PPM - Pulse Position Modulation.

Private Network - A network established and operated for one user or user organization.

Programmers - Persons mainly involved in designing, writing, and testing computer software programs

Protocols - The rules for communication system operation that must be followed if communication is to be effected. Protocols may govern portions of a network or service. In digital networks, protocols are digitally encoded as instructions to computerized equipment.

Public Network - A network established and operated for more than one user with shared access, usually available on a subscription basis. See related international definition of PDN.

Read-Only - A type of disk that is prerecorded and can be used for retrieving data. A read-only disk cannot be overwritten. A read-only system will retrieve and display stored data, but the system cannot alter the stored data.

Read/Write - A type of disk that can be read and written upon. A read/write system will read and display stored data and alter data already recorded.

Scientific Computer System - A computer system designed to process structured mathematics (such as Fast Fourier Transforms), and complex, highly redundant information (such as seismic data, sonar data, and radar), with large, on-line memories and very high-capacity output.

SDLC - Synchronous Data Link Control—IBM's data link control for SNA. Supports a subset of HDLC modes.

SDN - Software-Defined Network.

Security - Physical, electrical, and computer (digital) coding procedures to protect the contents of computer files and data transmission from inadvertent or unauthorized disclosure to meet the requirements of the Privacy Act and national classified information regulations

Service Delivery Point - The location of the physical interface between a network and customer/user equipment

Simplex - Unidirectional communications.

Smart Box - A device for adapting existing DTE to new network standards such as OSI. Includes PADs and protocol convertors, for example.

SNA - Systems Network Architecture—Seven-layer communications architecture designed by IBM. Layers correspond roughly but not exactly to OSI model.

Software - Computer programs

Supplies - Includes materials associated with the use of operations of computer systems, such as printer paper, keypunch card, disk packs, and tapes.

Switched Circuit - Temporary connection between two network stations established through dial-up procedures.

Synchronous - Communications operation with separate, continuous clocking at both sending and receiving stations.

Systems Analyst - Individual who analyzes problems to be converted to a programmable form for application to computer systems.

Systems House - Vendor that acquires, assembles, and integrates hardware and software into a total system to satisfy the data processing requirements of an end user. The vendor also may develop systems software products for license to end users. The systems house vendor does not manufacture mainframes.

Systems Integrator - Systems house vendor that develops systems interface electronics, applications software, and controllers for the CPU, peripherals, and ancillary subsystems which may have been provided by a contractor or the government (GFE). This vendor may either supervise or perform the installation and testing of the completed system.

T1 - Bell System designation for 1.544 mbps carrier capable of handling 24 PCM voice channels.

TDM - Time Division Multiplexing—A multiplexing method that interleaves multiple transmissions on a single circuit by assigning a different time slot to each channel.

Token Passing - Local-area network protocol which allows a station to transmit only when it has the "token," an empty slot on the carrier.

TOP - Technical Office Protocol—Protocol developed by Boeing Computer Services to support administrative and office operations as complementary functions to factory automation implemented under MAP.

Turnkey System - System composed of hardware and software integrated into a total system designed to fulfill completely the processing requirements of a single application.

Twisted-Pair Cable - Communications cabling consisting of pairs of single-strand metallic electrical conductors, such as copper wires, typically used in building telephone wiring and some LANs.

Verification and Validation - Process for examining and testing applications and special systems software to verify that it operates on the target CPU and performs all of the functions specified by the user.

Voice-Grade - Circuit or signal in the 300-3300 Hz bandwidth typical of the public telephone system, nominally a 4 Khz user.

VTAM - Virtual Telecommunications Access Method—Host-resident communications software for SNA networks.

WORM - Write-Once, Read-Many—A type of disk that can be created one time. Once written on, the disk can only be read—otherwise data will be destroyed.

Write-Once - A type of disk that can be created one time. Once written on, the disk can only be read. It cannot be rewritten.

E

Other Considerations

When questions arise as to the proper place to count certain user expenditures, INPUT addresses the questions from the user viewpoint. Expenditures are then categorized according to the users' perception of the purchase.

B
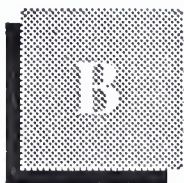
Glossary of Federal Acronyms

The federal government's procurement language uses a combination of acronyms, phrases, and words that is complicated by different agency definitions and interpretations. The government also uses terms of accounting, business, economics, engineering, and law with new applications and technology.

Acronyms and contract terms that INPUT encountered most often in program documentation and interviews for this report are included here, but this glossary should not be considered all-inclusive. Federal procurement regulations (DAR, FPR, FAR, FIRMR, FPMR) and contract terms listed in RFIs, RFPs, and RFQs provide applicable terms and definitions.

Federal agency acronyms have been included to the extent they are employed in this report.

A

Federal Acronyms

AAS	Automatic Addressing System.
AATMS	Advanced Air Traffic Management System.
ACS	Advanced Communications Satellite (formerly NASA 30/20 GHz Satellite Program).
ACT-1	Advanced Computer Techniques (Air Force).
Ada	DoD High-Order Language.
ADA	Airborne Data Acquisition.
ADL	Authorized Data List.
ADNET	Anti-Drug Network.
ADS	Automatic Digital Switches (DCS).
AFA	Air Force Association.
AFCEA	Armed Forces Communications Electronics Association.
AGE	Aerospace Ground Equipment.
AIP	Array Information Processing.

AIS	Automated Information System.
AMD	Acquisition Management Directorate.
AMPE	Automated Message Processing Equipment.
AMPS	Automated Message Processing System.
AMSL	Acquisition Management Systems List.
ANG	Army National Guard
AP(P)	Advance Procurement Plan.
Appropriation	Congressionally approved funding for authorized programs and activities of the Executive Branch.
APR	Agency Procurement Request.
ARC	Acquisition Review Council.
ARPANET	DARPA network of scientific computers.
ASP	Aggregated Switch Procurement
ATLAS	Abbreviated Test Language for All Systems (for ATE-Automated Test Equipment).
Authorization	In the legislative process programs, staffing, and other routine activities must be approved by Oversight Committees before the Appropriations Committee will approve the money from the budget.
AUSA	Association of the U.S. Army.
AUTODIN	AUTOmatic DIgital Network of the Defense Communications System.
AUTOSEVOCOM	AUTOmatic SEcure VOice COMmunications Network
AUTOVON	AUTOmatic VOice Network of the Defense Communications System.
BA	Basic Agreement.
BAFO	Best And Final Offer.
Base level	Procurement, purchasing, and contracting at the military installation level.
BCA	Board of Contract Appeals.
Benchmark	Method of evaluating ability of a candidate computer system to meet user requirements.
Bid protest	Objection (in writing, before or after contract award) to some aspect of a solicitation by a valid bidder.
BML	Bidders Mailing List—qualified vendor information filed annually with federal agencies to automatically receive RFPs and RFQs in areas of claimed competence.
BOA	Basic Ordering Agreement.
B&P	Bid and Proposal—vendor activities in response to government solicitation/specific overhead allowance.
BPA	Blanked Purchase Agreement.
Budget	Federal Budget, proposed by the President and subject to Congressional review.
C^2	Command and Control.
C^3	Command, Control, and Communications.
C^4	Command, Control, Communications, and Computers.
C^3I	Command, Control, Communications, and Intelligence.
CAB	Contract Adjustment Board or Contract Appeals Board.
CADE	Computer-Aided Design and Engineering.
CADS	Computer-Assisted Display Systems.
CAIS	Computer-Assisted Instruction System.

CALS	Computer-Aided Logistics Support.
CAPS	Command Automation Procurement Systems.
CAS	Contract Administration Services or Cost Accounting Standards.
CASB	Cost Accounting Standards Board.
CASP	Computer-Assisted Search Planning.
CBD	*Commerce Business Daily*—U.S. Department of Commerce publication listing government contract opportunities and awards.
CBO	Congressional Budget Office.
CCEP	Commercial Comsec Endorsement Program
CCDR	Contractor Cost Data Reporting.
CCN	Contract Change Notice.
CCPDS	Command Center Processing and Display Systems.
CCPO	Central Civilian Personnel Office.
CDR	Critical Design Review.
CDRL	Contractor Data Requirement List.
CFE	Contractor-Furnished Equipment.
CFR	Code of Federal Regulations.
CICA	Competition in Contracting Act
CIG	Computerized Interactive Graphics.
CIM	Corporate Information Management or Center for Information Management.
CINCs	Commanders-in-Chief.
CIR	Cost Information Reports.
CM	Configuration Management.
CMI	Computer-Managed Instruction.
CNI	Communications, Navigation, and Identification.
CO	Contracting Office, Contract Offices, or Change Order.
COC	Certificate of Competency (administered by the Small Business Administration).
COCO	Contractor-Owned, Contractor-Operated.
CODSIA	Council of Defense and Space Industry Associations.
COMSTAT	Communications Satellite Corporation.
CONUS	CONtinental United States.
COP	Capability Objective Package.
COTR	Contracting Officer's Technical Representative.
COTS	Commercial Off-the-Shelf (Commodities).
CP	Communications Processor.
CPAF	Cost-Plus-Award-Fee Contract.
CPFF	Cost-Plus-Fixed-Fee Contract.
CPIF	Cost-Plus-Incentive-Fee Contract.
CPR	Cost Performance Reports.
CPSR	Contractor Procurement System Review.
CR	Cost Reimbursement (Cost Plus Contract).
CSA	Combat or Computer Systems Architecture.
CSIF	Communications Services Industrial Fund.
C/SCSC	Cost/Schedule Control System Criteria (also called "C-Spec").
CWAS	Contractor Weighted Average Share in Cost Risk.

DAB	Defense Acquisition Board.
DABBS	Defense Acquisition Bulletin Board System.
DAL	Data Accession List.
DAR	Defense Acquisition Regulations.
DARPA	Defense Advanced Research Projects Agency.
DAS	Data Acquisition System.
DBHS	Data Base Handling System.
DBOF	Defense Business Operating Fund.
DCA	Defense Communications Agency (see DISA).
DCAA	Defense Contract Audit Agency.
DCAS	Defense Contract Administration Services.
DCASR	DCAS Region.
DCC	Digital Control Computer.
DCP	Development Concept Paper (DoD).
DCS	Defense Communications System.
DCTN	Defense Commercial Telecommunications Network.
DDA	Dynamic Demand Assessment (Delta Modulation).
DDC	Defense Documentation Center.
DDI	Director of Defense Information.
DDL	Digital Data Link—A segment of a communications network used for data transmission in digital form.
DDN	Defense Data Network.
DDS	Defense Distribution System.
DECCO	DEfense Commercial Communications Office.
DECEO	DEfense Communications Engineering Office.
D&F	Determination and Findings—required documentation for approval of a negotiated procurement.
DFAS	Defense Finance and Accounting Service.
DIA	Defense Intelligence Agency.
DIF	Document Interchange Format, Navy-sponsored word processing standard.
DISA	Defense Information Systems Agency (Formerly DCA).
DHHS	Department of Health and Human Services.
DIDS	Defense Integrated Data Systems.
DISC	Defense Industrial Supply Center.
DLA	Defense Logistics Agency.
DMA	Defense Mapping Agency.
DMR	Defense Management Review.
DMRD	Defense Management Review Decision.
DNA	Defense Nuclear Agency.
DO	Delivery Order.
DOA	Department of Agriculture (also USDA).
DOC	Department of Commerce.
DOE	Department of Energy.
DOI	Department of Interior.
DOJ	Department of Justice.
DOS	Department of State.
DOT	Department of Transportation.
DPA	Delegation of Procurement Authority (granted by GSA under FPRs).

DPC	Defense Procurement Circular.
DQ	Definite Quantity Contract.
DQ/PL	Definite Quantity Price List Contract.
DR	Deficiency Report.
DRFP	Draft Request For Proposal.
DSCS	Defense Satellite Communication System.
DSN	Defense Switched Network.
DSP	Defense Support Program (WWMCCS).
DSS	Defense Supply Service.
DTC	Design-To-Cost.
DTN	Defense Transmission Network.
ECP	Engineering Change Proposal.
ED	Department of Education.
EEO	Equal Employment Opportunity.
8(a) Set-Aside	Agency awards direct to Small Business Administration for direct placement with a socially/economically disadvantaged company.
EMC	Electro-Magnetic Compatibility.
EMCS	Energy Monitoring and Control System.
EO	Executive Order—Order issued by the President.
EOQ	Economic Ordering Quantity.
EPA	Economic Price Adjustment.
EPA	Environmental Protection Agency.
EPMR	Estimated Peak Monthly Requirement.
EPS	Emergency Procurement Service (GSA) or Emergency Power System.
EUC	End User Computing, especially in DoD.
FA	Formal Advertising.
FAC	Facility Contract.
FAR	Federal Acquisition Regulations.
FCA	Functional Configuration Audit.
FCC	Federal Communications Commission.
FCDC	Federal Contract Data Center.
FCRC	Federal Contract Research Center.
FDPC	Federal Data Processing Center.
FEDSIM	Federal (Computer) Simulation Center (GSA).
FEMA	Federal Emergency Management Agency.
FFP	Firm Fixed-Price Contract (also Lump Sum Contract).
FIPR	Federal Information Processing Resource.
FIPS	NBS Federal Information Processing Standard.
FIPS PUBS	FIPS Publications.
FIRMR	Federal Information Resource Management Regulations.
FMS	Foreign Military Sales.
FOC	Final Operating Capability.
FOIA	Freedom of Information Act.
FP	Fixed-Price Contract.
FP-L/H	Fixed-Price—Labor/Hour Contract.
FP-LOE	Fixed-Price—Level-Of-Effort Contract.

FPMR	Federal Property Management Regulations.
FPR	Federal Procurement Regulations.
FSC	Federal Supply Classification.
FSG	Federal Supply Group.
FSN	Federal Supply Number.
FSS	Federal Supply Schedule or Federal Supply Service (GSA).
FSTS	Federal Secure Telecommunications System.
FT Fund	A revolving fund, designated as the Federal Telecommunications Fund, used by GSA to pay for GSA-provided common-user services, specifically including the current FTS and proposed FTS 2000 services.
FTSP	Federal Telecommunications Standards Program administered by NCS; Standards are published by GSA.
FTS	Federal Telecommunications System.
FTS 2000	Replacement of the Federal Telecommunications System.
FY	Fiscal Year.
FYDP	Five-Year Defense Plan.
GAO	General Accounting Office.
GFE	Government-Furnished Equipment.
GFM	Government-Furnished Material.
GFY	Government Fiscal Year (October to September).
GIDEP	Government-Industry Data Exchange Program.
GOCO	Government Owned—Contractor Operated.
GOGO	Government Owned—Government Operated.
GOSIP	Government Open Systems Interconnection Profile.
GPO	Government Printing Office.
GPS	Global Positioning System.
GRH	Gramm-Rudman-Hollings Act (1985), also called Gramm-Rudman Deficit Control.
GS	General Schedule.
GSA	General Services Administration.
GSBCA	General Services Administration Board of Contract Appeals.
HCFA	Health Care Financing Administration.
HHS	(Department of) Health and Human Services.
HPA	Head of Procuring Activity.
HSDP	High-Speed Data Processors.
HUD	(Department of) Housing and Urban Development.
I-CASE	Integrated Computer-Aided Software Engineering.
IAR	Senior IRM Official.
ICA	Independent Cost Analysis.
ICAM	Integrated Computer-Aided Manufacturing.
ICE	Independent Cost Estimate.
ICP	Inventory Control Point.
ICST	Institute for Computer Sciences and Technology, National Bureau of Standards, Department of Commerce.
IDAMS	Image Display And Manipulation System.

IDEP	Interservice Data Exchange Program.
IDIQ	Indefinite Delivery-Indefinite Quantity.
IDN	Integrated Data Network.
IFB	Invitation For Bids.
IOC	Initial Operating Capability.
IOI	Internal Operating Instructions.
IPS	Integrated Procurement System.
IQ	Indefinite Quantity Contract.
IR&D	Independent Research & Development.
IRM	Information Resources Management.
IXS	Information Exchange System.
JCS	Joint Chiefs of Staff.
JCALS	Joint Computer-Aided Logistics Support.
JFMIP	Joint Financial Management Improvement Program.
JOCIT	Jovial Compiler Implementation Tool.
JSIPS	Joint Systems Integration Planning Staff.
JSOP	Joint Strategic Objectives Plan.
JSOR	Joint Service Operational Requirement.
JUMPS	Joint Uniform Military Pay System.
JWAM	Joint WWMCCS ADP Modernization (Program).
LC	Letter Contract.
LCC	Life Cycle Costing.
LCMP	Life Cycle Management Procedures (DD7920.1).
LCMS	Life Cycle Management System.
L-H	Labor-Hour Contract.
LOI	Letter of Interest.
LRPE	Long-Range Procurement Estimate.
LRIRP	Long-Range Information Resource Plan.
LTD	Live Test Demonstration.
MAISRC	Major Automated Information Systems Review Council (DoD).
MANTECH	MANufacturing TECHnology.
MAPS	Multiple Address Processing System.
MAP/TOP	Manufacturing Automation Protocol/Technical and Office Protocol.
MASC	Multiple Award Schedule Contract.
MDA	Multiplexed Data Accumulator.
MENS	Mission Element Need Statement or Mission Essential Need Statement (see DD-5000.1 Major Systems Acquisition).
MILSCAP	Military Standard Contract Administration Procedures.
MIL SPEC	Military Specification.
MIL STD	Military Standard.
MIPR	Military Interdepartmental Purchase Request.
MLS	Multilevel Security.
MNF	Multi-National Force.
MOD	Modification.
MOL	Maximum Ordering Limit (Federal Supply Service).

MPC	Military Procurement Code.
MYP	Multi-Year Procurement.
NARDIC	Navy Research and Development Information Center.
NASA	National Aeronautics and Space Administration.
NBS	National Bureau of Standards.
NCA	National Command Authorities.
NCMA	National Contract Management Association.
NCS	National Communications System (evolving to DISN).
NICRAD	Navy-Industry Cooperative Research and Development.
NIP	Notice of Intent to Purchase.
NMCS	National Military Command System.
NSA	National Security Agency.
NSEP	National Security and Emergency Preparedness.
NSF	National Science Foundation.
NSIA	National Security Industrial Association.
NTIA	National Telecommunications and Information Administration of the Department of Commerce; (replaced the Office of Telecommunications Policy in 1970).
NTIS	National Technical Information Service.
Obligation	"Earmarking" of specific funding for a contract from committed agency funds.
OCS	Office of Contract Settlement.
OFCC	Office of Federal Contract Compliance.
Off-Site	Services to be provided near but not in government facilities.
OFMP	Office of Federal Management Policy (GSA).
OFPP	Office of Federal Procurement Policy.
OIRM	Office of Information Resources Management.
O&M	Operations & Maintenance.
OMB	Office of Management and Budget.
O,M&R	Operations, Maintenance, and Readiness.
On-Site	Services to be performed on a government installation or in a specified building.
OPM	Office of Procurement Management (GSA) or Office of Personnel Management.
Options	Sole-source additions to the base contract for services or goods to be exercised at the government's discretion.
OSADBU	Office of Small and Disadvantaged Businesses.
OSHA	Occupational Safety and Health Act.
OSI	Open System Interconnect.
OSP	Offshore Procurement.
OTA	Office of Technology Assessment (Congress).
Out-Year	Proposed funding for fiscal years beyond the Budget Year (next fiscal year).
P-1	FY Defense Production Budget.
P3I	Pre-Planned Product Improvement (program in DoD).
PAR	Procurement Authorization Request or Procurement Action Report.
PAS	Pre-Award Survey.
PASS	Procurement Automated Source System.
PCO	Procurement Contracting Officer.
PDA	Principal Development Agency.

PDM	Program Decision Memorandum.
PDR	Preliminary Design Review.
PIR	Procurement Information Reporting.
PME	Performance Monitoring Equipment.
PMP	Purchase Management Plan.
PO	Purchase Order or Program Office.
POE	Panel Of Experts.
POM	Program Objective Memorandum.
POSIX	Portable Open System Interconnection Exchange.
POTS	Purchase of Telephone Systems.
PPBS	Planning, Programming, Budgeting System.
PR	Purchase Request or Procurement Requisition.
PRA	Paperwork Reduction Act.
PS	Performance Specification—alternative to a Statement of Work, when work to be performed can be clearly specified.
QA	Quality Assurance.
QAO	Quality Assurance Office.
QMCS	Quality Monitoring and Control System (DoD software).
QMR	Qualitative Material Requirement (Army).
QPL	Qualified Products List.
QRC	Quick Reaction Capability.
QRI	Quick Reaction Inquiry.
R-1	FY Defense RDT&E Budget.
RAM	Reliability, Availability, and Maintainability.
RC	Requirements Contract.
R&D	Research and Development.
RDA	Research, Development, and Acquisition.
RDD	Required Delivery Date.
RD&E	Research, Development, and Engineering.
RDF	Rapid Deployment Force.
RDT&E	Research, Development, Test, and Engineering.
RFI	Request For Information.
RFP	Request For Proposal.
RFQ	Request For Quotation.
RFTP	Request For Technical Proposals (Two-Step).
ROC	Required Operational Capability.
ROI	Return On Investment.
RTAS	Real Time Analysis System.
RTDS	Real Time Display System.
SA	Supplemental Agreement.
SADBU	Small and Disadvantaged Business Utilization.
SBA	Small Business Administration.
SB Set-Aside	Small Business Set-Aside contract opportunities with bidders limited to certified small businesses.
SCA	Service Contract Act (1964 as amended).

|	
SCN	Specification Change Notice.
SDN	Secure Data Network.
SEC	Securities and Exchange Commission.
SE&I	Systems Engineering and Integration.
SETA	Systems Engineering/Technical Assistance.
SETS	Systems Engineering/Technical Support.
SIBAC	Simplified Intragovernmental Billing and Collection System.
SIMP	Systems Integration Master Plan.
SIOP	Single Integrated Operations Plan.
Sole Source	Contract award without competition.
Solicitation	Invitation to submit a bid.
SOR	Specific Operational Requirement.
SOW	Statement of Work.
SSA	Source Selection Authority (DoD).
SSAC	Source Selection Advisory Council.
SSEB	Source Selection Evaluation Board.
SSO	Source Selection Official (NASA).
STINFO	Scientific and Technical INFOrmation Program—Air Force/NASA.
STU	Secure Telephone Unit.
SWO	Stop-Work Order.
Synopsis	Brief Description of contract opportunity in CBD after D&F and before release of solicitation.
TA/AS	Technical Assistance/Analysis Services.
TCP/IP	Transmission Control Protocol/Internet Protocol.
TEMPEST	Studies, inspections, and tests of unintentional electromagnetic radiation from computer, communication, command, and control equipment that may cause unauthorized disclosure of information; usually applied to DoD and security agency testing programs.
TILO	Technical and Industrial Liason Office—Qualified Requirement Information Program—Army.
TM	Time and Materials contract.
TOA	Total Obligational Authority (Defense).
TOD	Technical Objective Document.
TQM	Total Quality Management.
TR	Temporary Regulation (added to FPR, FAR).
TRACE	Total Risk Assessing Cost Estimate.
TRCO	Technical Representative of the Contracting Offices.
TREAS	Department of Treasury.
TRP	Technical Resources Plan.
TSP	GSA's Teleprocessing Services Program.
TVA	Tennessee Valley Authority.
UCAS	Uniform Cost Accounting System.
USA	U.S. Army.
USAF	U.S. Air Force.
USCG	U.S. Coast Guard.
USMC	U.S. Marine Corps.

USN	U.S. Navy.
U.S.C.	United States Code.
USPS	United States Postal Service.
USRRB	United States Railroad Retirement Board.

VA	Veterans Affairs Department.
VE	Value Engineering.
VHSIC	Very High Speed Integrated Circuits.
VIABLE	Vertical Installation Automation BaseLine (Army).
VICI	Voice Input Code Identifier.
VTC	Video Teleconferencing.

WAM	WWMCCS ADP Modernization Program.
WBS	Work Breakdown Structure.
WGM	Weighted Guidelines Method.
WIN	WWMCCS Intercomputer Network.
WITS	Washington Interagency Telecommunications System.
WIS	WWMCCS Information Systems.
WS	Work Statement—Offerer's description of the work to be done (proposal or contract).
WWMCCS	World-Wide Military Command and Control System.

B

General and Industry Acronyms

ADAPSO	Association of Data Processing Service Organization, now the Computer Software and Services Industry Association. (See ITAA).
ADP	Automatic Data Processing.
ADPE	Automatic Data Processing Equipment.
ANSI	American National Standards Institute.

| BOC | Bell Operating Company. |

CAD	Computer-Aided Design.
CAM	Computer-Aided Manufacturing.
CASE	Computer-Aided Software Engineering.
CBEMA	Computer and Business Equipment Manufacturers Association.
CCIA	Computers and Communications Industry Association.
CCITT	Comite Consultatif Internationale de Télégraphique et Téléphonique; Committee of the International Telecommunication Union.
COBOL	COmmon Business-Oriented Language.
COS	Corporation for Open Systems.
CPU	Central Processor Unit.

| DMBS | Data Base Management System. |
| DRAM | Dynamic Random Access Memory. |

EIA	Electronic Industries Association.
EPROM	Erasible Programmable Read-Only Memory.
IEEE	Institute of Electrical and Electronics Engineers.
ISDN	Integrated Services Digital Networks.
ISO	International Organization for Standardization; voluntary international standards organization and member of CCITT.
ITAA	Information Technology Association of America (Formerly ADAPSO).
ITU	International Telecommunication Union.
LSI	Large-Scale Integration.
MFJ	Modified Final Judgement.
PROM	Programmable Read-Only Memory.
RBOC	Regional Bell Operating Company.
UNIX	AT&T Proprietary Operating System.
UPS	Uninterruptable Power Source.
VAR	Value-Added Reseller.
VLSI	Very Large-Scale Integration.
WORM	Write-Once-Read-Many-Times.
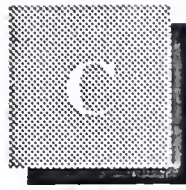
Policies, Regulations, and Standards

A

OMB Circulars

A-11	Preparation and Submission of Budget Estimates.
A-49	Use of Management and Operating Contracts.
A-71	Responsibilities for the Administration and Management of Automatic Data Processing Activities.
A-109	Major Systems Acquisitions.
A-120	Guidelines for the Use of Consulting Services.
A-121	Cost Accounting, Cost Recovery, and Integrated Sharing of Data Processing Facilities.
A-123	Internal Control Systems.
A-127	Financial Management Systems.
A-130	Management of Federal Information Resources.
A-131	Value Engineering.

B

GSA Publications

The FIRMR as published by GSA is the primary regulation for use by federal agencies in the management, acquisition, and use of both ADP and telecommunications information resources.

C

DoD Directives

DD-5000.1	Major System Acquisitions.
DD-5000.2	Major System Acquisition Process.
DD-5000.11	DoD Data Administration (C3I).
DD-5000.31	Interim List of DoD-Approved, High-Order Languages.
DD-5000.35	Defense Acquisition Regulatory Systems.
DD-5200.1	DoD Information Security Program.

DD-5200.28	Security Requirements for Automatic Data Processing (ADP) Systems.
DD-5200.28-M	Manual of Techniques and Procedures for Implementing, Deactivating, Testing, and Evaluating Secure Resource Sharing ADP Systems.
DD-7920.2	Major Automated Information Systems Approval Process.
DD-7935	Automated Data Systems (ADS) Documentation.
DoDD 3405.1	Computer Programming Language Policy
DoDD 5000.11	DoD Data administration (C31)
DoDI 5000.12	Data Elements and Data Codes Standardization Procedure
DoDI 5000.18	Implementation of Standard Data Elements and Related Features
DoDD 5105.19	Defense Information Systems Agency
DoDD 5110.4	Washington Headquarters Services
DoDD 5118.3	Comptroller of the Department of Defense
DoDD 5137.1	Assistant Secretary of Defense (Command, Control, Communications, and Intelligence)
DoDD 7740.1	DoD Information Resources Management Program
DoD 7740.1-G	DoD ADP Internal Control Guideline
DoDD 7740.2	Automated Information System (AIS) Strategic Planning
DoDI 7740.3	Information Resources Management (IRM) Review Program
DoDD 7750.5	Management and Control of Information Requirements
DoDI 7750.7	DoD Forms Management Program
DoDI 7920.2-M	Automated Information Systems (AIS) Life-Cycle Manual
DoDI 7920.4	Baselining of Automated Information Systems (AISs)
DoDI 7920.5	Management of End User Computing (EUC)
DoDI 7930.1	Information Technology Users Group Program
DoDI 7930.2	ADP Software Exchange and Release
DoDD 7950.1	Automated Data Processing Resources Management
DoD 7950.1-M	Defense Automated Resources Management Manual of Information Requirements

D

Standards

ADCCP	Advanced Data Communications Control Procedures; ANSI Standard X3.66 of 1979; also NIST FIPS 71.
CCITT G.711	International PCM standard.
CCITT T.0	International standard for classification of facsimile apparatus for document transmission over telephone-type circuits.

DEA-1	Proposed ISO standard for data encryption based on the NIST DES.
EIA RS-170	Monochrome video standard.
EIA RS-170A	Color video standard.
EIA RS-464	EIA PBX standards.
EIA RS-465	Standard for Group III facsimile.
EIA RS-466	Facsimile standard; procedures for document transmission in the General Switched Telephone Network.
EIA RS-232-C	EIA DCE to DTE interface standard using a 25-Pin connector; similar to CCITT V-24.
EIA RS-449	New EIA standard DTE to DCE interface which re places RS-232-C.
FED-STD 1000	Proposed Federal Standard for adoption of the full OSI reference model.
FED-STD 1026	Federal Data Encryption Standard (DES) adopted in 1983; also FIPS 46.
FED-STD 1041	Equivalent to FIPS 100.
FED-STD 1061	Group II Facsimile Standard (1981).
FED-STD 1062	Federal standard for Group III facsimile; equivalent to EIA RS-465.
FED-STD 1063	Federal facsimile standard; equivalent to EIA RS-466.
FED-STDs 1005, 1005A-1008	Federal Standards for DCE Coding and Modulation.
FIPS 46	NIST Data Encryption Standard (DES).
FIPS 81	DES Modes of Operation.
FIPS 100	NIST Standard for packet-switched networks; subset of 1980 CCITT X.25.
FIPS 107	NIST Standard for local-area networks, similar to IEEE 802.2 and 802.3.
FIPS 146	Government Open Systems Interconnection (OSI) Profile (GOSIP).
FIPS 151	NIST POSIX (Portable Operating System Interface for UNIX) standard.
IEEE 802.2	OSI-Compatible IEEE standard for data-link control in local-area networks.
IEEE 802.3	Local-area network standard similar to Ethernet.
IEEE 802.4	OSI-compatible standard for token bus local-area networks.
IEEE 802.5	Local-area networks standard for token ring networks.
IEEE P1003.1	POSIX standard, similar to FIPS 151.

MIL-STD-188-114C	Physical interface protocol similar to RS-232 and RS-449.
MIL-STD-1777	IP-Internet Protocol.
MIL-STD-1778	TCP - Transmission Control Protocol.
MIL-STD-1780	File Transfer Protocol.
MIL-STD-1781	Simple Mail Transfer Protocol (electronic mail).
MIL-STD-1782	TELNET - virtual terminal protocol.
MIL-STD-1815A	Ada Programming Language Standard.
SVID	UNIX System Interface Definition.
X.12	ANSI standard for Electronic Data Interchange
X.21	CCITT standard for interface between DTE and DCE for synchronous operation on public data networks.
X.25	CCITT standard for interface between DTE and DCE for terminals operating in the packet mode on public data networks.
X.75	CCITT standard for links that interface different packet networks.
X.400	ISO application-level standard for the electronic transfer of messages (electronic mail).